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Agriculture.

COTTON CROP OF 1915-16.

The total cotton crop harvested last season amounted to only 11 tons; whilst in the previous year the yield was less than half that quantity, seed cotton being understood. In every 1,000 lb. of seed cotton, there are 400 lb. of lint and 600 lb. of seed. Thus the 11 tons of last year's crop gave a return of 4,400 lb. of lint and 6,600 lb. of seed. In the local market the lint is worth 7d. per lb.; and, from advices received from the United States of America and London, the price of cotton is rapidly advancing. Latest advices give the current price at 9d. per lb.; but, owing to the ravages of the boll weevil and of a new and even worse pest, called by the significant name of "Red Hot," combined with a very wet season, the American cotton crop will be very short and prices must

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ERNEST WICKHAM,
Manager for Queensland.

rise. Hermann and Wolf, cotton brokers in New Orleans, wrote on 24th June as follows:—

"We stated in these letters not long ago that the world would likely need a crop of 15,000,000 bales the coming year, even should the war continue. The steady depletion of the stocks in Europe and this country since then has given increasing emphasis to this size crop being a probable requirement. The trend of the takings by the spinners of the world clearly supports this view also.

"Leaving out only the northern part of Georgia and the two Carolinas, the damage the weevil is almost certain to do east of the river, clean through to the Atlantic coast, and the lack of fertiliser in that section make the production of such a crop rather problematical. Conditions could easily develop that would make the crop 1,000,000 bales less, or even a greater amount."

T. O. Walton, Chief of Farm Demonstration Work Extension Service, A. and M. College Station, Texas, wrote on 17th June:—

"Last fall the E.S. and the Department of Agriculture called the attention of the Texas farmers to the boll weevil situation then existing, and suggested that, unless the stalks were turned under or cut and burned early and the winter hibernating places destroyed, there would be a very heavy infestation of the weevil in 1916. Many of the farmers profited by these suggestions. Many of them, however, did not, and at this time the boll weevils are making their appearance in practically all of the States except the extreme northern part of the Texas cotton belt. Without doubt we have the heaviest infestation of weevils coming out of winter hibernation this spring that we have had for a number of years, and, if the cotton growers do not observe every precaution, the damage of the 1916 Texas cotton crop will probably be 500,000 bales. At the present price of cotton this will represent a direct loss to Texas farmers of 30,000,000·00 dollars for the 1916 crop. A large percentage of this loss can be prevented if the farmers in the weevil-infested territory will use the precautions advocated by the U.S. Department of Agriculture and the Extension Service of the A. and M. College.

"At the present time, while the cotton is yet very small, some of it without squares and some just beginning to set squares, the farmers will find it profitable, provided cheap labour can be secured, to have the weevils hand-picked and killed, and all punctured squares picked and burned. One adult weevil, or one square that has young weevils growing on it, destroyed now, will mean several thousand weevils less within the next few weeks."

The directions for further measures for the destruction of the weevil, if carried out in this State, would effectually put a stop to any cotton growing in Queensland. Fortunately, we have no boll weevil or "Red Hot" here; and the Department of Agriculture will take every precaution to prevent its introduction with imported seed.

In view of the almost certain shortage of cotton this coming season in the United States, the prospects for growers in this State are very

good; and we would advise farmers to take advantage of the opportunity offered by the Department of Agriculture and Stock to obtain a supply of the best variety of American cotton seed. A 5 or 10 acre plot of cotton can easily be attended to without in the least interfering with the production of other crops or with the work of the dairy. As regards the picking, it should be noted that all the bolls do not mature at the same time, so that continuous work is not required in order to get in the whole crop. Taking the cost of picking at ½d. per lb., the selling price of seed cotton at 1¾d. per lb., and the crop at 1,000 lb. per acre, the net profit from 10 acres would be £52 4s. 8d. without reckoning the value of the seed (about 2 tons 13 cwt.) at £12 per ton, total, £83 in round numbers, or £8 6s. per acre nett. It must be understood that, although the Department offers 1¾d. per lb. for seed cotton of any good variety, whatever profit arises from the sale of the cotton when ginned, or from the seed if sold, will be distributed *pro ratâ* amongst the farmers who supply cotton to the Department.

UTILISING MAIZE STALKS.

From 220 lb. of maize stalks, they now produce in the United States by modern processes and machinery 22 lb. afrecho, 24 lb. feeding cake, 9 lb. maize oil, 73 lb. flour, 48 lb. glucose, 4 lb. dextrine, and 26 lb. starch. When maize was grown on a large scale in the mid-western and southern States of U.S.A., it was customary either to turn cattle into the fields after the harvest, or to allow stockowners to do so for a nominal payment of 2s. per acre.

During the last five years, however, science has stepped in, and revolutionary discoveries were made owing to which "the despised maize stalk has become almost as valuable as the grain it produces," and many farmers, instead of 2s. per acre, are now receiving 16s. 8d. to 33s. 4d. per acre. In the great maize belt, which runs through eight of the States, there are about 50,000,000 acres dedicated to the cultivation of maize, so that, if only 16s. 8d. per acre is added to the value of their produce, it means an addition of over £40,000,000 to the income of the farmers. The products of the maize stalks are so various, and each of such utility, that there does not appear to be much risk of the demand for them falling short of the supply. These are the articles that have already been made on a commercial scale from the stalks:—

(1) Cellulose for packing coffer dams of battleships, thus preventing them sinking when pierced with shells, because the water on first entering is absorbed, causing the pith to swell, closing up the perforation automatically as it were.

(2) Pyroxyline varnish, a liquid made from cellulose, the uses of which are practically unlimited.

(3) Cellulose for making smokeless powder and other high explosives.

(4) Cellulose for packing, it being the most perfect non-conductor known against heat or electricity, jars or blows.

(5) Paper pulp; and it is predicted that fine book paper will be one of the principal products of the stalks, and will arrest the alarming destruction of the American forests for wood pulp, which is now proceeding.

(6) Stock food made from the finely-ground outer shells, and from the sides and joint of the stalks.—"Pastoral Review."

A NEW COTTON-PICKING MACHINE.

The cotton planters in the United States of America are surely on the high road to the invention of a really practical cotton-picking machine. Not a year passes during which some new machine, or an improvement on older ones, is brought forward. In the "Cotton and Cotton Oil News," published at Memphis, Tennessee, for 24th July, a new inexpensive machine is depicted and described as follows:—

THE SOUTHERN COTTON-PICKER COMPANY OF MEMPHIS HAS PUT OUT A NEW DEVICE FOR PICKING COTTON, SIMPLE AND SUCCESSFUL THEY CLAIM.

A machine to pick cotton from the bolls has long been the dream of inventors as well as of cotton-growers.

It is a problem which has challenged the inventive genius of man.

Yet it would seem not to be a more difficult problem to solve than that which confronted Whitney when he set about to devise a machine for separating the lint from the seed. Whitney succeeded, and to-day the cotton gin links his name with a fame that can never die.

The same measure of immortality awaits him who shall make a machine to save the labour of hand-picking and facilitate the gathering of the great cotton crop.

Many have been the efforts in this direction, but the Southern Cotton-picking Company of Memphis, Tenn., claims to have solved the problem.

A cut of this machine is given here. It certainly is not complicated, and it appears easy of operation, as it is simple in construction. It does not pick with suction, but with brushes.

The picker head, which is driven by a flexible shaft, contains two bristle brushes that mesh together at a velocity of 400 revolutions a minute; a small pin wheel, with teeth, combs the cotton from the brushes, then conveyed through a 1½-in. tube into container sack in rear by air, a small fan creating the vacuum back of the picker head which conveys the cotton into the sack.

The operator, after starting the engine, has nothing to do but apply the picker head with flexible tubes to each boll that is open, and instantly the cotton is deposited in the conveyor used for this purpose.

The picker head is protected against entry of any trash or bolls by a wire guard over its end just outside of the brushes, through which

guards the brushes lap, pulling the cotton into same, making it impossible for a boll to go through this guard, and nearly so for any section of a boll to enter the brushes. This system will not pick either dry or green leaves unless small particles of leaf should adhere to the back of cotton when same is picked.

It is made for one man to handle in the field.

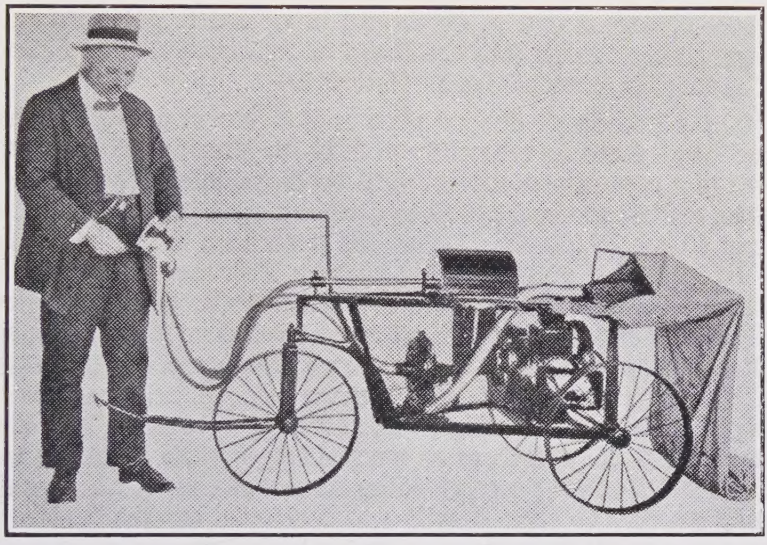


Plate 23.—A New Device for Picking Cotton.

Being constructed of iron, steel, and aluminium, it is light and durable. It is driven by less than half a gallon of petrol for 12 hours.

Here is the proof of the pudding. They say: "We averaged in January in a muddy field with cold weather, wearing gloves, with our cotton picker, 60 lb. an hour."

For further information, write the Southern Cotton Picker Company, Memphis, Tenn.

LEACHING OF NITRATES FROM THE SOIL.

During a discussion at a meeting of planters in Madras, the question of nitrates was raised, and it was suggested that saltpetre might perhaps replace sulphate and muriate of potash during the war. This is now always feasible. In the first place, while it is true that saltpetre is an excellent source of potash, it also contains 10 per cent. of nitrogen in the form of nitrate which cannot be ignored. The soil does not retain nitrates like it absorbs potash, and the consequence is that if the application of saltpetre is followed by heavy rain the nitrate part of it is leached out into the drains and is lost. It might be possible to always apply it at a time when the rains are only light, but this is not always convenient

from a labour point of view, and it is not in all cases desirable that the crop should get a heavy dose of quickly available nitrogen which will give it a flush of foliage. Saltpetre is a high-priced fertilser, so that one cannot afford to apply it in wet weather and allow the nitrates to deliberately be lost for the sake of the potash; and consequently it will not altogether and in all cases replace the ordinary potash fertiliser.

The extent to which nitrates do wash out of the soil is illustrated by Messrs. E. J. Russell and A. Appleyard in an article published in the May issue of the "Journal of the Board of Agriculture," the following digest of which is extracted from "Nature":—

"Of the Broadbank dunged plots at Rothamsted one was fallowed and one cropped during the winter of 1915-16. During the summer the fallowed plot accumulated nitrate until by the middle of September the top 18 in. of soil contained 170 lb. of nitric nitrogen per acre, equivalent to nearly 10 cwt. of nitrate of soda. The losses then began, and were so heavy in November and December that by February the magnificent stock of nitrate had been reduced to 50 lb. of nitrogen. This loss is equivalent to 7 cwt. of nitrate of soda—no small item at present prices. The Broadbank fallow plot is no doubt an extreme case, but the cropped plot also suffered considerable loss. It never accumulated nitrate like the fallow plot, the maximum being 90 lb. of nitrogen per acre; half of this was lost during the winter, or as much nitrogen as is contained in 24 bushels of wheat and the corresponding amount of straw. The losses are naturally greatest on these heavily manured soils, but the fields which were not unusually well done lost about 30 lb. of nitrogen per acre. Some of the loss on the fallow plot could have been prevented by sowing mustard or other quick-growing crop in September. This could have been fed off or ploughed in, thus holding the nitrogen in less soluble form until the spring. The obvious lesson is that land which has been got into good condition in autumn should at once be sown with either the crop it is intended to carry or a catch crop."

A green dressing established on the land following an application of nitrates, especially if wet weather is to be expected, is undoubtedly a good thing, and it goes far to prevent loss by leaching. In the case of coffee, however, this is not always possible on account of the shade, which prevents the green dressing growing.—"Planters' Chronicle," Madras.

GRAIN OR DRY DISTRICT SORGHUMS.

By G. B. BROOKS, Instructor in Agriculture.

In tropical and subtropical countries the raising of a more consistent producing grain than maize has, during recent years, received a good deal of consideration. Reports coming to hand from various countries show that the grain sorghums give promise to become of equal importance to maize. The qualities that recommend them are: Heavy yields of grain, high feeding value, drought resistance, and freedom from insect pests and disease.

As showing the extent to which these sorghums are raised in other countries it is estimated that in India some 25,000,000 acres are raised annually, while extensive areas are under this crop both in China and South Africa. Considerable expansion has lately taken place in the United States of America.

Its introduction into Queensland is by no means of recent date. In the annual report of the department for the year 1889-90 mention is made of the introduction of Kafir Corn, Yellow Milo, and several saccharine varieties. Very favourable reports were received as to their suitability to Queensland conditions, but their use either as a grain or fodder crop did not in any way become general. Since then scattered introductions have been made from time to time, but it is only recently that the question of ascertaining their true value has been taken in hand.

CLASSIFICATION.

There has been no complete botanical classification of the sorghum family. The species *Andropogon sorghum* is held to include all groups of cultivated sorghums. There are hundreds of strains or varieties, and these have been separated into two divisions—viz., the saccharine and non-saccharine.

Saccharine or "Feed" Sorghums.—The stalks of this type contains a large amount of sweet juice which, in some countries, is made into syrup. In Queensland they are grown exclusively as a fodder. This type is also recognised by the grain, which has a bitter astringent taste.

Grain or Dry District Sorghums.—In this type there is little or no saccharine matter in the stalk. The grain is non-astringent and has a slightly nutty flavour. It is largely used in India, China, and Africa for human consumption; hence the term "Grain Sorghum."

TESTS CARRIED OUT.

Several promising varieties of this crop were introduced from the United States of America two seasons ago and propagated at Gatton College. Seed was secured from this planting for experimental purposes, and during the past season demonstration plots were established in various parts of the State, the objective being to ascertain their grain-producing qualities under varying conditions of soil and climate. The season was, on the whole, very favourable to this test. In several districts where the maize crops were—on account of the absence of rain—practically a failure, yields as high as 50 bushels per acre were harvested from the grain sorghums. Unfortunately, in several centres the plots were attacked by flocks of parrots, making it impossible to secure dependable data as to yield.

The varieties planted in the respective districts were—Cream Milo, Feterita or Soudan Dhoura, Standard Milo, Shantung Dwarf Kaoliang, Dwarf Milo, Valley Kaoliang, and Black Hull Kafir.

The term "Milo" is a corruption of the word Milium—Millet. Kaoliang is Chinese, Kao—large, Liang—Millet. Dhoura or Durra is the

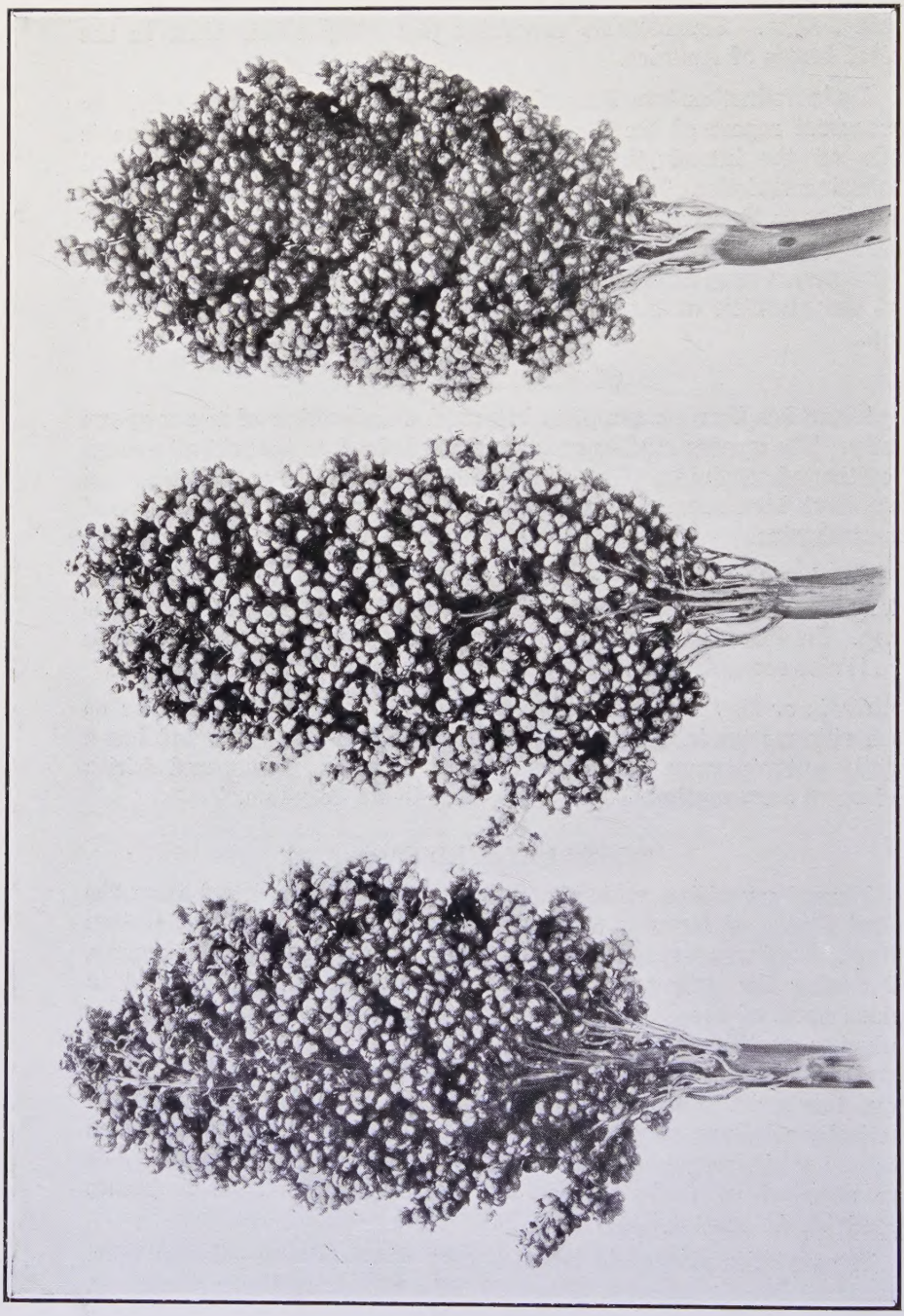


PLATE 24.—GRAIN SORGHUMS.

1. Standard Milo. 2. Cream Milo. 3. Dwarf Milo.

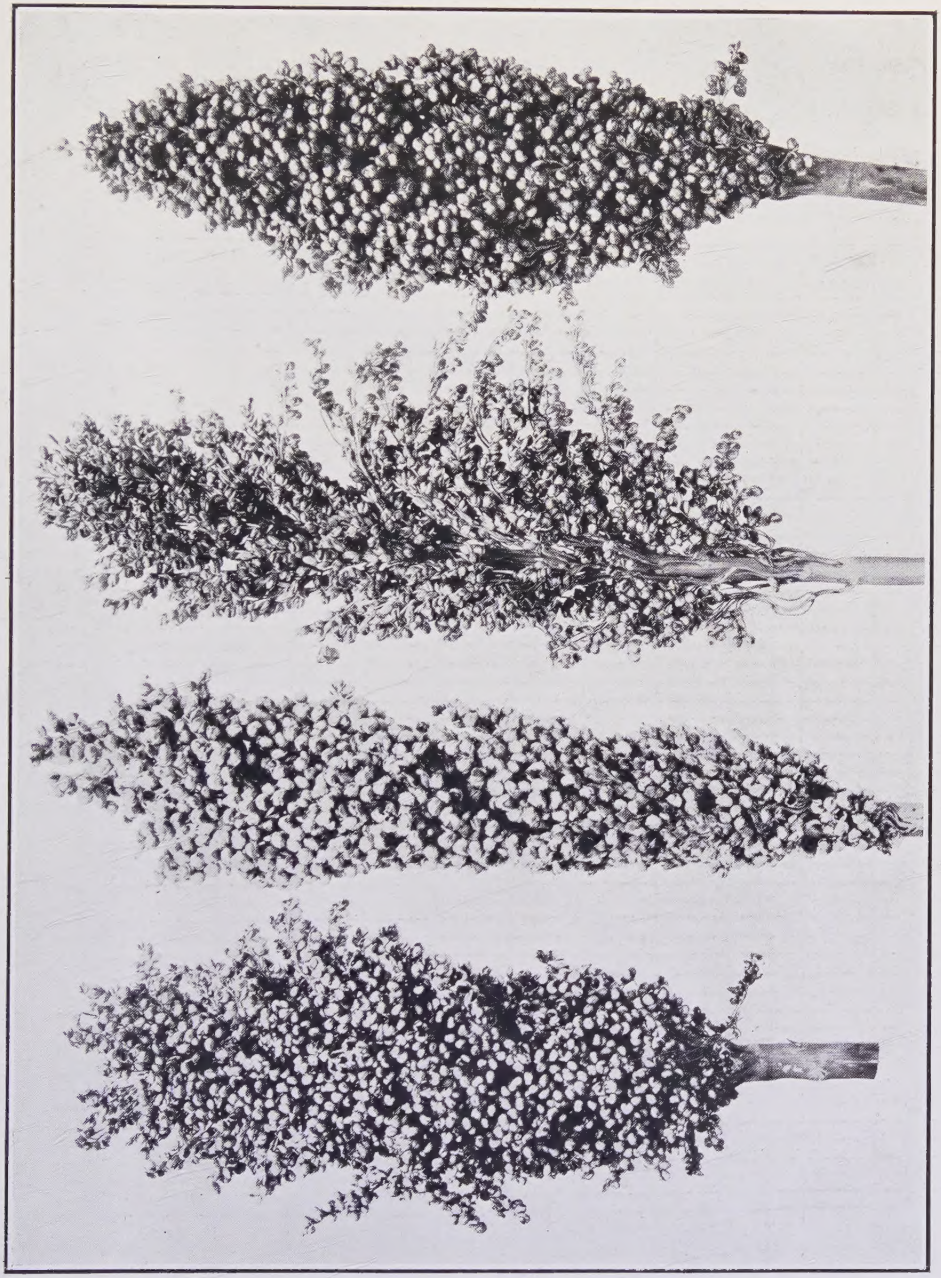
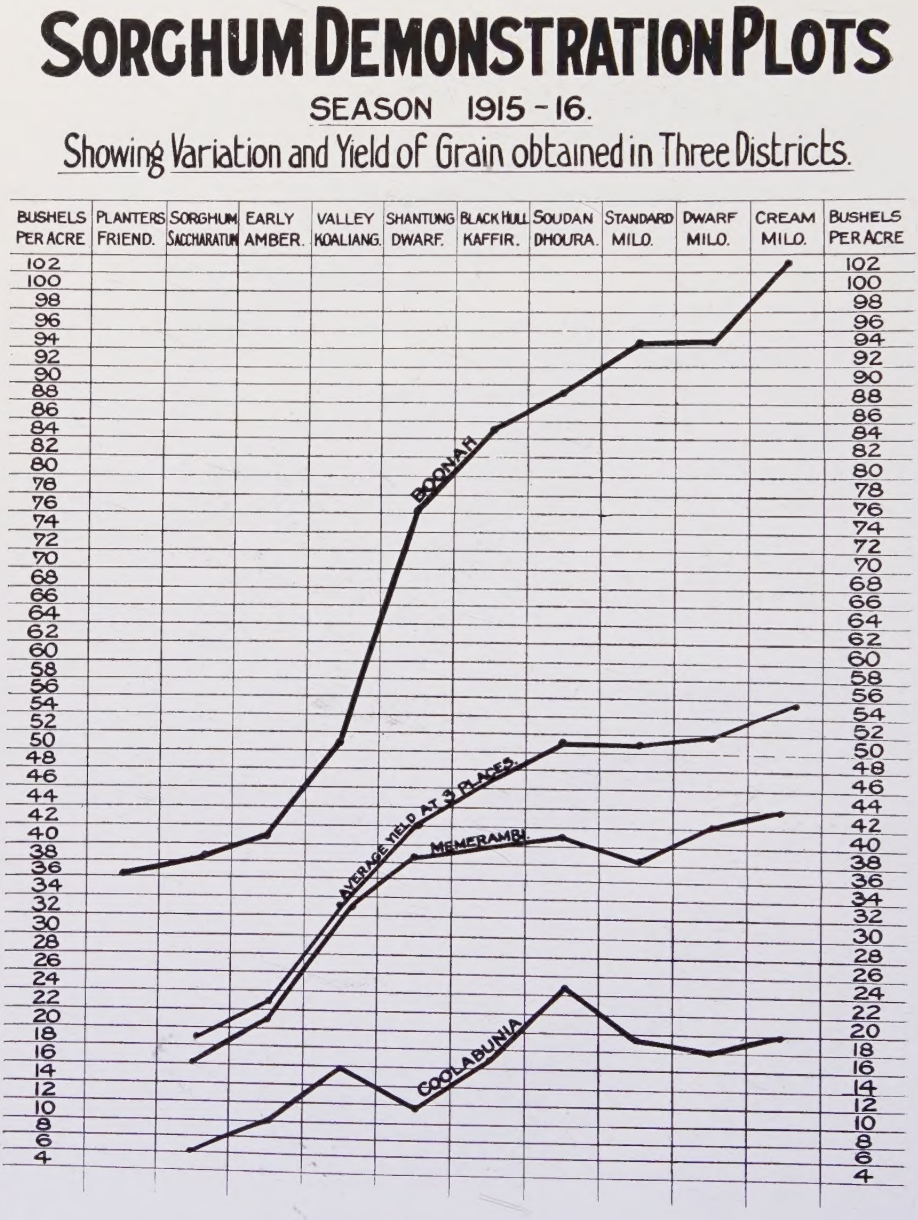


PLATE 25.—GRAIN SORGHUMS.

1. Black Hull Kafir. 2. Soudan Dhoura. 3. Valley Kaoliang. 4. Shantung Dwarf Kaoliang.

Indian name for grain-bearing sorghums. Illustrations of typical heads of the above varieties are shown on Plates 24 and 25.

The accompanying Graph shows the yield per acre at three centres.



VALUE AS A FODDER.

Although the saccharine sorghums are grown principally for the grain, they are likely to become of considerable value as a fodder crop in the drier portions of the State, on account of their drought-resistant qualities. A comparison was made in connection with the experiments

carried out, by including three of our heaviest yielding fodder varieties, viz.—Planters' Friend, E. Amber, and Saccharatum. The yield in tons per acre are shown in Graph No. G.

BRIEF HINTS ON GROWING THE CROP.

Climate.—Conditions suitable for growing maize are equally adapted for grain sorghums; but, being a dry-district crop, much better results will be secured in hot, dry situations than from corn. Frost is fatal to the maturing of the crop, more especially in the coastal districts.

Soil.—Although adapted to a very wide range of soil, best results are obtained from fairly heavy loams. It is imperative that a plentiful supply of plant food should be available, owing to the quick-maturing habit of this group of plants. This is induced by early and deep cultivation. Good results are often secured in low, damp situations, where the growing of maize would be unprofitable.

Time to Plant.—Being a heat-loving plant, sowing should be deferred until the soil is warm and sufficient moisture present in the soil to insure germination. The time taken to mature by most of the varieties is about three and a-half months in Southern Queensland. It would, therefore, not be advisable to plant much later than the middle of January. Sowing operations could be continued to a much later date in both the Central and Northern divisions.

Method of Planting.—The distance between the rows should not be less than 3 ft. In soils of rather low fertility 3 ft. 6 in. is recommended. Sowing can be carried out with the ordinary maize-planter, either fitted with special plates or drilling smaller holes in those used for maize, filling up the large openings with lead or cork. The small openings should be countersunk from below, otherwise the grain will set fast in the holes. In planting small areas the rows can be opened up either with the plough, scuffler, or spring-tooth harrow. The seed can be dropped by hand, using a coffee or syrup tin tied to a walking-stick. Two or three holes are punched in line through the bottom of the tin from inside—a little larger than the seed to be planted; and by shaking this device a very even seeding can be obtained. Harrows are used for covering the grain. The wheat-drill may also be used by closing up a number of the tubes so that the rows will be the required distance apart. The depth to plant depends to some extent upon the character of the soil and the amount of moisture present. A covering of from one to two inches is generally sufficient.

SEED REQUIRED PER ACRE.

When grown for grain in rows 3 ft. 6 in. apart, 3½ lb. of seed is sufficient to sow an acre. In planting a large-grained variety, such as

Feterita, a little more seed is required, while of a smaller-grained sort, such as Black Hull Kafir, a little less can be used. If intended for fodder an extra pound of seed to the above may be used per acre.

AFTER-CULTIVATION.

When the plants are well up the field should be gone over with light harrows. This should be followed shortly after with the scuffler, cultivating deeply before the roots have developed and lightly after. Frequent stirrings invariably mean high yields.

HARVESTING.

When grown for seed the crop should be allowed to stand until the grain is quite hard. If cut before being fully ripe the grain will not only be more difficult to thresh out but will be liable to mould when stored and to infestation by weevils.

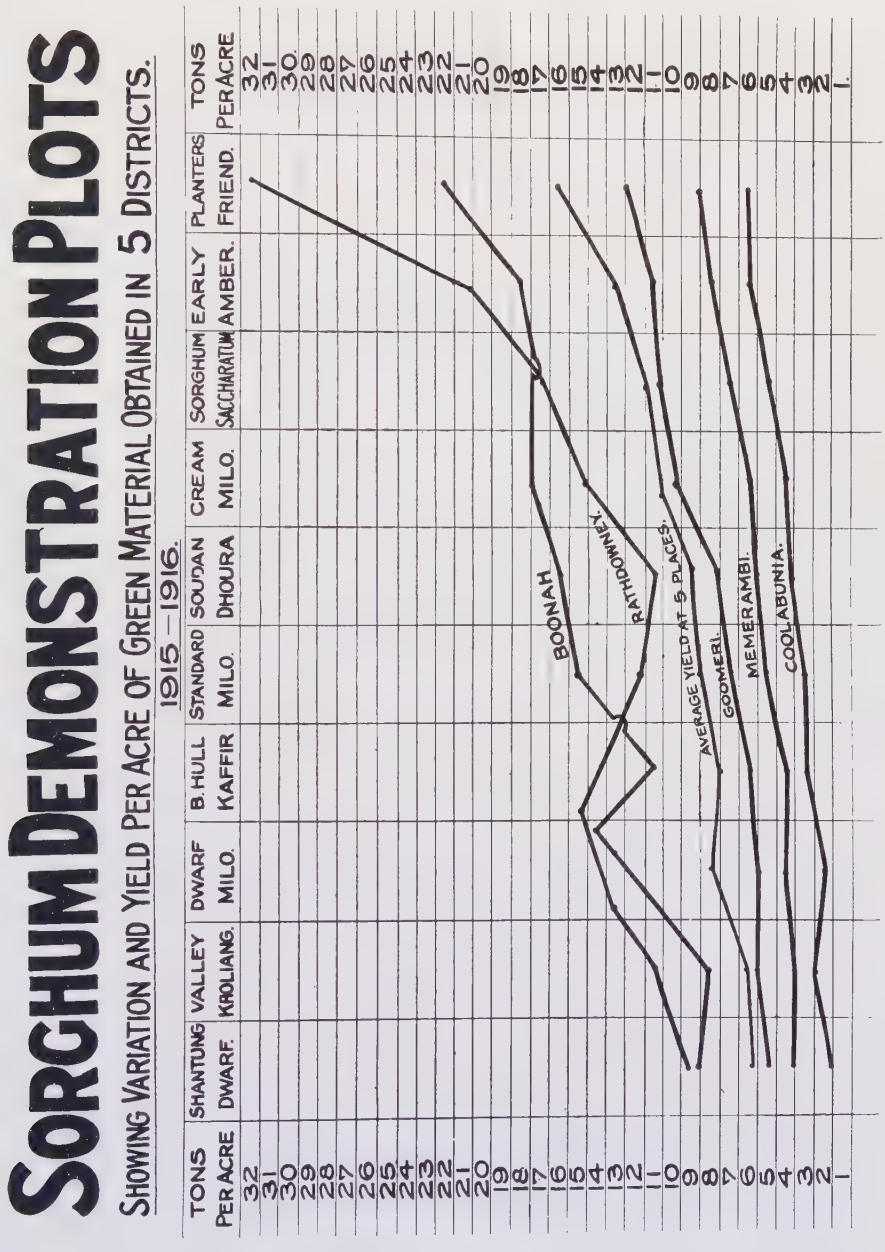
Dwarf varieties can be harvested with the ordinary wheat-binder or maize-harvester. Small areas can be headed with a large knife and carted direct to the barn. The wheat-thresher is undoubtedly the best machine for removing the grain. Several types of corn-shellers can also be used, the concave being set much closer to the drum than for maize. The broom millet hackler does not make a satisfactory thresher, on account of the pegs stripping the seed off in bunches. This defect can be overcome by screwing pieces of timber to the drum of equal depth to the pegs. A similar piece should be fixed to the breast of the machine and almost close to the drum to insure clean threshing.

IMPROVING THE CROP BY SELECTION.

The grain intended for future plantings should be selected from the standing crop. Only heads that are true to type, of even height, early maturity, dwarf habit, erect and fairly compact heads, with freedom from side branching and stooling, should be selected.

With the object of improving the quality of the crop the Department of Agriculture last season established stud plots in several districts. A feature of these stud plots was the "ear-to-row" tests, each ear or head being planted in a separate row. Very satisfactory results were obtained. These tests are being continued during the coming season with seed carefully selected from last season's operations. Before threshing out the grain the average weight of the heads of the respective varieties were recorded. Those were exceptionally heavy, as was to be expected from the high yields obtained and shown in the accompanying graph.

The averages were, in ounces: Black Hull Kafir, 3 4/5; Cream Milo, 4¾; Valley Kaoling, 3½; Dwarf Milo, 4¼; Shantung Dwarf Kaoling, 3 1/5; Standard Milo, 4¼; Feterita, 4; Selected Crossbred, 7 oz.



Theoretically a crop grown, say, of Cream Milo, with six heads to the square yard, and each head weighing 4¾ oz., would give a yield of 153 bushels of 56 lb. each per acre.

FEEDING VALUE.

This is very satisfactory, as shown by the following analysis and remarks made by the Agricultural Chemist, Mr. Brünnich. It will be noted that a comparison is made with wheat and maize.

Variety.	Moisture.	True Protein.	Starch	Crude Fibre.	Fat.	Ash.	Total Nitrogen.	Protein Nitrogen.
St. Milo	10·94	10·22	70·34	3·18	3·51	1·81	1·652	1·638
Dwarf Milo ..	13·50	9·17	69·71	1·98	3·30	1·84	1·610	1·549
Soudan Dhoura ..	13·56	13·56	65·52	2·18	3·21	1·97	2·225	2·170
Cream Milo ..	13·25	11·02	68·34	2·03	3·35	2·01	1·854	1·765
Average { Wheat ..	11·10	14·80	67·40	3·20	2·20	1·30	..	2·368
Average { Maize ..	12·	13·10	65·80	2·00	5·50	1·60	..	2·096

Remarks.—"The analysis of the grains of the non-saccharine sorghums prove these grains to be a valuable food for horses, cattle, swine, and poultry. The best sample—Soudan Dhoura (Feterita)—closely approximates, and although not quite so rich in oils it is equal with regard to protein and carbohydrates. No strict comparison can be made between these grains and wheat or maize on account of great individual variation; but on the whole they must be classed as more starchy, and should therefore be particularly valuable for the production of industrial alcohol. The grain can also be made into a tasty and nutritious meal for human consumption."

The white or cream varieties should be selected for household use. Both Soudan Dhoura and Cream Milo are excellent in this respect, making a delicious porridge either alone or mixed with other meals.

The grain can be treated with a small hand grinding-mill, of which there are several kinds on the market. A cheap and effective method for grinding small quantities is by using a coffee-mill, costing about 10s.

MARKET GARDENING.

AN APPLIANCE FOR DESTROYING THE FRENCH BEAN FLY.

By R. E. GARDINER, Townsville.

The following is a description of an appliance designed by the writer for destroying the French bean fly. Its action depends upon a habit which the fly has of invariably making a rapid upward flight when disturbed:—

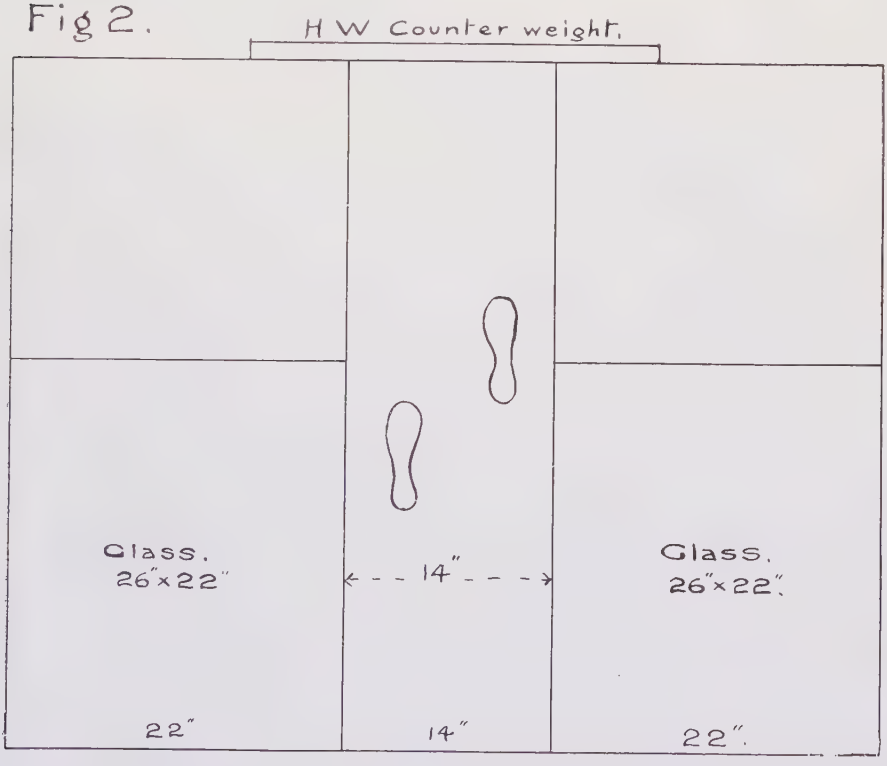
The appliance in its simplest form consists of a sheet of window glass set in a light wooden frame. A drape or curtain of calico about 6 in. wide is attached to three sides of the frame. If the frame be now

held 6 in. from the ground in a horizontal position, an enclosure on three sides is made by the suspended drape, the glass forming a roof to the enclosure.

A pair of wooden handles about 4 ft. in length are attached to the upper side of the frame at an angle of about 45 degrees. The appliance is now ready to use. To use, the frame is first inverted, and the glass sprinkled lightly with kerosene. The kerosene quickly spreads into a thin film over the surface of the glass.

The frame is now returned to its original position. The film of kerosene is now on the under side of the glass. The frame is carried over the young bean plants, open side of the enclosure first, being held so that the front of the frame is 9 or 10 in. from the ground; and the

Fig 2.



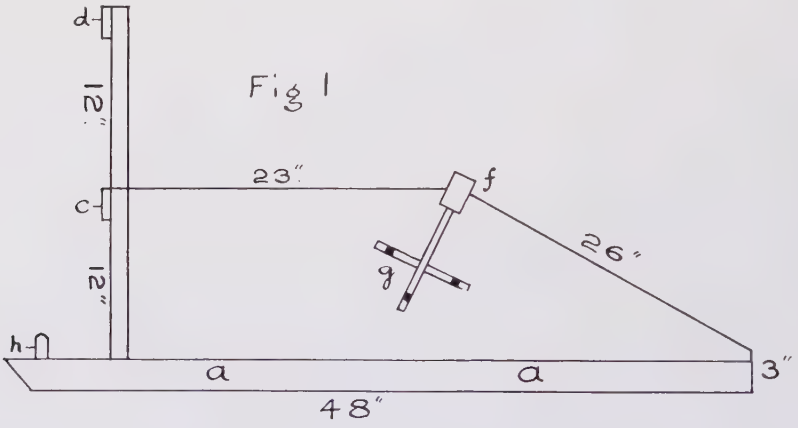
rear part just allows the glass to clear the young bean plants. The advancing sheet of glass passes over the flies before they rise, and, being disturbed by the drape, they fly sharply upward, strike the glass, become saturated with kerosene from the film, and die instantly. Many of the dead flies adhere to the glass; others fall to the ground.

The foregoing appliance will serve for very small gardens.

For larger gardens a double frame may be made, as in Fig. 2, and carried by the hands or suspended by a pole from the shoulders. It may be made of light laths and the lightest make of glass.

For large market gardens a horse-drawn machine, such as is used by the writer, may be constructed as follows:—The two ends of the frame are cut from a piece of 12 by 1 pine to the shape and size shown in Fig. 1. Along the outer face of each end at the lower edge, a piece of 3 by 2 hardwood (*a*) is bolted. This hardwood projects about 9 in. in front of the frame, and is dressed upwards at this end and acts as a sled runner. A piece of 3 by 1½ pine (*b*) is now bolted crosswise on the inner face of each end, projecting 12 in. at the top side.

The ends are now connected by horizontals of 3 by 1½ pine at the points (*c*) and (*d*). These horizontals are bolted to the upright (*b*). At (*f*) a horizontal of 3 by 2 pine is fixed to each end by means of an angle of 1½ by ⅜ bar iron, which is bolted to the inner face of each end, and along the horizontal. About 9 in. of iron on the face and about 15 in. along the horizontal are sufficient. A cross should be welded into the portion attached to the face (see (*g*), Fig. 1) to prevent warping



of the frame. Four window sashes, 24 in. by 24 in., are attached to this horizontal by hinges. At the rear part of each sash pieces of 3 by 1 pine are attached to serve as runners and keep this part of the sash a constant height of about 4 in. off the ground. The sashes are spaced so as to bring the centre of each sash over a bean row. The spaces between the sashes are covered by light boards fastened to one sash and overlapping the adjoining one. Drapes of American leather about 7 in. in depth are fastened to laths a few inches longer than the width of each sash, and are fixed to the rear parts of the sashes. Calico or hessian is stretched between and fastened to the horizontals (*d*) and (*f*). A loop

or staple (*h*) is made fast to each runner. A horse is hooked to the staples, and the machine is ready to use. To use, the sashes are turned back and allowed to rest on the horizontal (*d*) while they are being sprinkled with kerosene. This is the best position to have them in when transporting the machine to different parts of garden.

After sprinkling, turn the sashes down and draw the machine over the plants. A light brush placed about midway of the sashes to disturb the flies is an advantage. A light piece of bamboo branch with the branchlets on serves the purpose very well. The kerosene film evaporates quickly, and requires to be renewed, say, every five minutes; and the glass must be kept clean and clear.

A piece of hessian, with a few threads pulled out at one end and made into a roll, makes a good kerosene sprinkler.

Plate 26.—An Appliance for Destroying the French Bean Fly.

If the flies are very prevalent, the beans should be gone over every day for the first nine days from the time they appear. If there are only a few flies and no infected plants near, an occasional treatment whenever the flies are observed is sufficient. After the ninth day, the attacks of the fly are not very destructive, and, as the younger plants are always preferred by the flies, a crop may be protected after this stage by sowing a row of beans in the near vicinity nine or ten days after the crop is planted. The intelligent use of trap crops is a valuable adjunct, and should not be neglected.

In the machine shown in the Photo., A is 10 ft. in length overall, and covers four rows of beans 30 in. apart. Two of the sashes are shown turned back for sprinkling.

MUSHROOMS.

Mushrooms are widely distributed in this State, and large quantities may be seen growing in paddocks frequented by stock. Unfortunately, poisonous mushrooms or toadstools (the names being interchangeable) are also very plentiful; severe poisoning and even death have resulted from eating mushrooms gathered by inexperienced persons, especially young children. Some toadstools are exceedingly poisonous, but most of them are not; and some are edible. In a short article on "Mushrooms, Edible and Poisonous," by D. C. Babcock, Ohio Agricultural Experiment Station, Circular No. 153, the author says that there is no reliable test to distinguish edible and poisonous mushrooms. The common silver coin test is unreliable, as both edible and poisonous mushrooms have the same action on the coin. Another test is that, if the upper skin peels off readily, the mushroom is edible. However, poisonous toadstools can also be peeled. An agreeable flavour is also no test, as some of the poisonous mushrooms possess a very pleasing taste. More certain methods of testing fungi are by eating them (Mr. Gibson's physiological test); but, in testing out a mushroom by eating, a long drawn-out process is involved, as very small bits of the raw toadstool are swallowed, but none of the juice. This is repeated every twenty-four hours, three or four times; and if at the end no disagreeable effects are produced, one may be safe in trying a larger quantity. It must be remembered that only a very small amount of the species known as "Deadly Amanita" is required to produce serious poisoning effects. A better method is by learning from the experience of others and studying the toadstool in question and the various books written on the subject. A few rules should be adhered to:—

WHAT TO AVOID.

1. All mushrooms in the young or "button" stage. At this stage of growth, it is impossible to determine, except after long experience, some poisonous species from some edible species.

2. Avoid all those with pores on the under side of the cap, until sufficient acquaintance teaches the difference between the edible and poisonous varieties.

3. Avoid all species which have white spores, a ring, and a volva or bulb-like base together on the same specimen. The most poisonous species are in this group, which has also gills.

4. Avoid those having a milky juice, unless the milk is red.

5. Avoid those having the cap thin in comparison with the gills, especially if they are bright coloured, and in which the gills are nearly all of the same length.

6. Avoid all mushrooms which are not strictly fresh, since decay sometimes greatly increases poisonous substances. By following these

rules implicitly, one may avoid the most poisonous kinds; but the novice should experiment with the greatest caution.

The Common Meadow Mushroom (*Agaricus campestris*) has a white or drab-coloured stalk and cap. The gills (shown in the up-turned

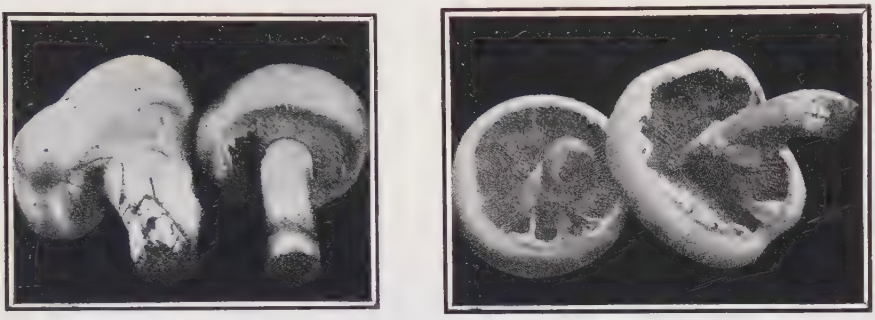


Plate 27.—Fig. 1. Common Meadow Mushroom (*Agaricus campestris*). Edible.

specimens in the photograph) are pinkish to brownish-purple. The stalk is rather short, cylindrical, solid, and possesses a ring around the stalk. It is never bulbous at the base, but straight and even.

The following terms are used in identifying mushroms, and a clear definition will be appreciated by the amateur, each point being illustrated:—

Volva.—A membraneous sac inclosing the young mushroom of many agaricaceous fungi. It is ruptured by the expanding pileus, and remains usually as a cap at the base of the stipe. Fig. 3—V.

Cap.—The expanded, umbrella-like top of a common mushroom. Fig. 3—C.

Gills.—Plates radiating from the stem attached to the cap on which the spores are borne. Fig. 3—G.

Spores.—The reproductive bodies (corresponding to seeds in higher plants) of mushrooms.

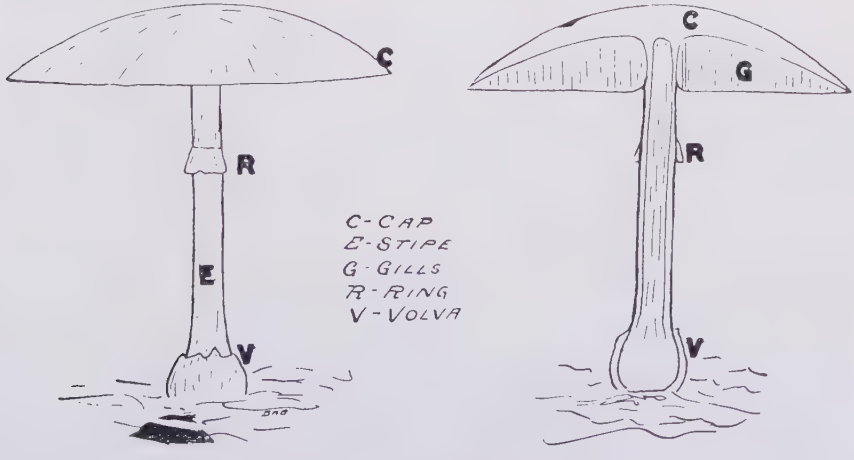


Plate 28.—Designation of Different Parts of Mushrooms

RING (ANNULUS).—Part of the veil or covering adhering to the stem of agarics. Fig 3—R.

SPAWN.—The popular name for mycelium used in growing mushrooms.

STIPE.—The stalk which supports the cap. Fig. 3—E.

The usual way of preparing a mushroom bed is to collect a quantity of horse droppings and place them in a trench 1 ft. deep and 4 ft. wide, treading them down firmly. Then obtain some spawn bricks from a seed shop, break them up into pieces about the size of a boy's marble, and set them 1 ft. apart almost on the surface of the manure. Give the bed a fair sprinkling of water; and, a few days later, cover the manure and spawn with 3 in. of fine soil. Should heavy rains occur in February, it is well to provide some shelter for the bed.

PLATE 29.—MUSHROOMS GROWN AT "HIGHLANDS," SAMFORD DISTRICT, BY MR. C. E. NICHOLS.

One of the strangest things about mushrooms is that they can be produced spontaneously, as it were, from a bed of manure. Without spawn or seed of any kind, get together a quantity of horse manure, place it in a small dark shed, tread it down firmly, and keep it moist. Very soon, on breaking part of it, small white threads will be noticed. This is the mushroom spawn. Mushrooms will spring up in abundance for about three weeks; but that exhausts the bed, and no more mushrooms will be got from it without introducing fresh spawn. Last year we made such a mushroom bed, and obtained 200 or 300 fine mushrooms from it, large numbers of them measuring from 5 to 6 in. in diameter.

The mushrooms shown in the Photograph No. 4 were grown at "Highlands," in the Samford district, by Mr. C. E. Nichols. The great size of them is shown by the foot rule and the teacup for comparison of the diameter.

EXHIBITION NOTES, 1916.

FIBROUS PLANTS AS A SOURCE OF PAPER.

Amongst the exhibits at the late Exhibition at Bowen Park was a very interesting display of aboriginal skill in basket and paper-making, shown by Mr. J. Campbell, M.A., of Gossypium Park, Kamma, near Cairns. The textile plants, mostly found growing in a wild state, have been proved by Mr. Campbell to be, if largely exploited, a most prolific source whence to derive supplies of paper for various purposes. The plants and the market values of the fibres produced from them are set forth in a short pamphlet distributed at the Textile Fibres Court, from which we take the following extracts:—

No. 1—Jute, Chinese Burr (Triumfetta and Urena).—A noxious weed, yet it may be made a most important industry. I was offered for the dyed fibre exhibited £35 per ton, and it costs less than £20 to produce as shown.

No. 2—Rosella Fibre.—The fruit of the rosella is worth 2d. to 3d. per lb. for jam; and, when the plants are rooted up, they yield 7 per cent. of fibre as shown, and its present value is £40 per ton. An acre will yield about half a ton, so that the fruit will be nearly all profit. Here is delightful, profitable employment.

No. 3—Wild Cotton (Hibiscus) Fibre.—I direct special attention to this, as the raw material is very abundant from Tweed Heads to Cape York. It is fibre prepared from the wild cotton tree, a variety of Hibiscus. It is worth £20 per ton, and any willing hand can prepare 1 cwt. a day—note £1 per day! My aboriginals have made some into cord to show you its quality.

No. 4—Sida Retusa (called the Queensland Hemp).—When this is in season, and it grows wild in very many places, 10s. to 15s. a day can easily be earned by preparing it—using very primitive machinery which any skilled labourer can construct.

No. 5—Pineapple Fibre.—When you have enjoyed or sold the luscious fruit, you can add greatly to your garden returns by preparing this, either as fibre or paper pulp.

No. 6—Papaw Fibre.—From that wonderful tree, 500 of which will bring you an income of £200 to £250 a year. Read remarks below:—

"But not only do these plants produce valuable fibre; they are all convertible into high-class *Paper Pulp*, for which there is almost unlimited demand.

"*Here is Work for Hundreds.*—Carefully study my samples and these notes. The raw material is abundant, waiting for your skill. Unfortunately no one renders me any financial assistance in my investigation into North Queensland raw material, and I have to bear the cost alone; and for years have spent nearly half my private income on the work. The sad war has curtailed my income, so I cannot come and talk to you about these wonderful natural resources of

Plate 30.—Aboriginal Work in Basket and Paper Weaving in the Cossyfitum Park Exhibit at Bowen Park, August, 1916.

North Queensland; but if you can come to me I will gladly tell you everything. It would cost me too much to print all I have to say; but any of you, if you fit my quotation at the beginning, can make from 10s. to 20s. a day; and, if you take care of yourself, can live a healthful life up here."

Paper Pulp, No. 1.—Made from Blady grass (Lalang). It is being made in South Malay. Why should we not make it here, and live in comfort out of the proceeds? It is one of the easiest occupations in which we can engage. My houseboy, Sam, a full-blooded aboriginal, made some of the paper here exhibited. Blady grass grows wild to the extent of up to 4 tons to the acre on good land, and anybody may cut it. Four tons will produce 1½ to 2 tons of pulp, according to its dryness, and this is worth £8 per ton. It will pay well to cultivate.

No. 2—Chinese Burr Pulp.—The whole plant is converted into pulp, but if you take the fibre the balance can be made into pulp; and, as this grows wild up to 6 tons to the acre, the occupation is very profitable. Three tons will make 1 ton of pulp.

No. 3—Sida Retusa Pulp.—The foregoing remarks apply to this also. The paper is very high class, suitable for bank notes and legal documents.

No. 4—Pulp from Cane Tops, thousands of tons of which are burnt off every season, but which make excellent paper, especially blotting-paper, now so scarce. The tops are worth from 10s. to 20s. a ton delivered.

No. 5—Megass Pulp—*i.e.*, the refuse cane as it comes through the rollers. This is burnt as fuel, but makes capital paper, as you will see by the samples. Megass is worth about 12s. 6d. to 15s. a ton delivered. As fuel it is worth 5s.

No. 6—Banana Pulp.—Bananas are a profitable crop to grow, even at 2s. a bunch; but when the plant has borne its fruit, the whole of it can be manufactured into paper pulp. The paper is of very high quality. It takes 5 tons of banana stems and leaves to make 1 ton of pulp, which is worth £10. Hence the work is very profitable.

No. 7—Pineapple Pulp.—What I have said about the banana, applies to pineapples.

No. 8—Pandanus Pulp.—While working at the pineapple, my aboriginal servant Sam said: "Boss, that one wild pineapple, that grow along swamp where cut firewood all same as this. He make him paper too." "Well done, Sam," said I, "go and get some at once." He did so, and in six hours it was converted into the sample of paper exhibited. I rewarded Sam with 2s. for his thoughtfulness, tapping his skull and saying, "Well, Sam, this one, meaning brain, earn that money for you—not your hands this time, but your head. I did not think of that plant. Well done, Sam." This material is very abundant in places, and a rough portable plant can be erected by willing workers on such spots. It

yields one-fifth of its green weight of high-class pulp as per sample exhibited.

No. 9—Wild Cotton (Hibiscus) Pulp.—This yields excellent fibre, as I have said, but more than this: The whole plant can be converted into excellent pulp, and the two operations, fibre and pulp making therefrom, easily spell "quick returns, good wages, and happy out-door life." Start the work at once. The raw material is most abundant.

No. 10—Bamboo Pulp.—Excellent, and in some tropical regions the industry is carried on; but we have so many other plants already waiting for our skill and labour that this can be passed over, excepting where they happen to be growing.

No. 11—Cotton.—In connection with the cotton (Caravonica) exhibit, Mr. Campbell very truly says:—"The need is great. After the war we trust there will be a revival of normal trade, and, as the surplus supplies of cotton are now considerably reduced, there will be a serious cotton famine if we do not arouse interest in the development of new cotton fields. The whole coast is suitable for the cultivation of this cotton. The exhibit shows what can be done in North Queensland. It is worth 1d. per lb. to pick, and a man can pick from 100 to 150 lb. a day. The lint—*i.e.*, ginned cotton—is worth 9½d. in Liverpool. Notice the garments and surgical wool—the best in the world."

HOME-CURING HAMS AND BACON.

"Farmer's Wife," Toowoomba—

We have given several recipes for curing hams and bacon in the Journal. Here is one, recommended in the "Farm Journal," Sydney:—

"The cause of hardness in bacon referred to is due to the excessive use of saltpetre, especially through using it during the first stages of curing. For home curing a suitable recipe is as follows:—Weigh out for each 100 lb. of meat 5 lb. of salt, 2 lb. of brown sugar, and 2 oz. of saltpetre. When the carcass is thoroughly set, cut up and salt lightly; then lay it overnight upon a clean concrete floor or table. By salting lightly is meant that as much salt as will cover the meat comfortably without undue waste be used. Next morning brush the salt off thoroughly; then dry-salt the meat with dry salt and brown sugar, rubbed well in daily for three days. On the fourth and fifth days a little saltpetre should be added to the salt and sugar, which should be well rubbed in, especially on the skin. Leave the bacon and hams in the mixture (dry salt and brown sugar) for about three weeks; but they should be turned every day or second day; at the same time continue rubbing during this period. Then wash clean, when the bacon and hams will be ready for smoking, the duration of which depends upon the taste of the manufacturer. After the first week or ten days, it is advisable to brush the salt and sugar off the inner side of the thin parts of the bacon (flaps). Note that dry salting should only be undertaken in cold weather and in a cool place."

Pastoral.

THE EXPERIMENTAL FEEDING OF CATTLE WITH PRICKLY-PEAR.

By FRANK SMITH, B.Sc., F.I.C.
(In charge of Prickly-pear Feeding Investigation, Wallumbilla.)

Primarily, the objective of the work of the Prickly-pear Feeding Station at Wallumbilla is to ascertain the truth concerning prickly-pear in regard to its utility as a stock food; secondarily, the nature of and limitations to its utility being established, to discover a system of feeding it that will give the best results in practice; and, thirdly, to investigate and to demonstrate the results accruing when it is rationally employed as a component of rations both for the maintenance of herds, for fattening purposes, for milk production, and for the raising of young stock.

The benefit that would result from the proving of pear a fodder of any considerable economic value, especially in the direction of assisting the more profitable occupation of pear-infested lands, is manifest. It is here emphasised, however, that experimental stock-feeding has not been undertaken on the *à priori* assumption that as an edible plant prickly-pear possesses special merit, or with the avowed object of demonstrating such, but with recognition of the fact that it can play a part in the nurture of grazing or farm-fed animals with results only in accordance with the established laws governing nutrition. Thus, it is impossible that pear possesses a value to the animal exceeding that of the nutriment it affords except that it furnishes water or may prove beneficial on account of its succulence. On the other hand, from its peculiar nature it may, when largely consumed, prove detrimental to animals partaking of it, and operate prejudicially upon the processes of fattening or growth, or detrimentally upon milk yield or the quality of the product. It is the aim of the present experimental feeding to establish the amount of nutriment provided by pear when fed to satisfaction of natural appetite or of appetite induced by artificial treatment, and to observe both the physiological and productive effect of pear rations.

The investigation has bearing both on the question of natural grazing on pear and its utilisation for farm-fed stock, inquiring, on the one hand, into impressions current among stockmen as to the grazing value of pear areas and the contribution of pear thereto; and, on the other, indicating the class and quantity of additional feeds with which it is necessary to supplement it in the adequate maintenance of stock and for productive farm-feeding, as well as the most economical and effective method of administering.

NATURAL PEAR GRAZING.

Summarised, in the relation of prickly-pear to natural grazing, it is anticipated that the solution of the following problems may be contributed to:—

(*a*) The comparative nutritive value and palatability of scrub and forest grown pear.

(*b*) The possible superiority in nutritive value and palatability of "varieties" of pear for which cattle appear to show preference.

(*c*) The amount of pear likely to be consumed by grazing stock.

(*d*) The effect of partaking of water by pear-fed animals.

(*e*) The possible contribution of pear to the sustenance of grazing stock alone or in conjunction with other herbage.

(*f*) The value of and contribution to fattening on pear areas of edible shrubs.

THE MAINTENANCE AND PRODUCTIVE FEEDING OF FARM STOCK.

During protracted drought and failure of pastures the possibility of preservation of herds by utilisation of prickly-pear as fodder becomes an actual problem. How far may pear contribute thereto, and how may its insufficiency be most adequately met? In the event of the impossibility of economically constituting pear a main constituent in productive rations, its function in maintenance may yet be shown to be considerable.

From the point of view of the herdsman, the subject of maintenance —in this relation the preservation of bodily condition in animals without increase of body tissue or provision for milk production—is of some importance as forming a basis for elaboration of rations designed for fattening or milking herds. In relation to the general question of feeding of farm cattle, the points following are under investigation:—

(*a*) The best method of preparing pear for feeding purposes, considering innocuity, palatability, and economy.

(*b*) The comparative values of scrub and forest pear for hand-fed stock.

(*c*) The demand of pear-fed animals for water.

(*d*) The physiological effect of high pear rations.

(*e*) The effectiveness of pear alone or with other feeds for maintenance of condition.

(*f*) The value of prickly-pear in rations designed for the fattening of mature stock.

PRICKLY-PEAR IN RATIONS OF MILKING HERDS.

It is proposed during 1917 to conduct experimental feeding of prickly-pear to milch cows. The general questions relating to hand-feeding at present under investigation will have direct bearing on this phase of economic pear utilisation. It is designed to test the comparative values of prickly-pear and other forms of roughage as a base in

milking rations in regard both to the quantity and quality of the product; in other words, to trace the effect of substitution of pear for such ordinary farm foods as it can wholly or in part replace in rations providing for maximum production. This is the fundamental problem with bearing on the possibility of economically using pear in the sustenance of milking herds, and a system of comparative feeding will afford a concrete basis for the evaluation of the plant. It may be pointed out that the findings of recent work on these lines in the United States, to which certain publicity has been given in Queensland, may not, in the opinion of the writer, be found to hold under local conditions—first, on account of the apparent abnormality of the animals employed; secondly, on account of the utilisation therein of considerable quantities of grain, a practice not customary locally; and, thirdly, and perhaps most important, because the varieties of pear used were not the prevalent *Opuntia inermis* of Western Queensland.

The third condition, indeed, apart from the fact that various pronouncements upon the value of prickly-pear as stock food elsewhere have not in all cases been based on sufficiently controlled experimentation, constitutes the chief reason for the institution of inquiry as a whole in Queensland. It is manifestly impossible to expect results favourable to the use of prickly-pear when it is constituted a portion of rations insufficient in total quantity or deficient in certain essential nutriment.

An extension of the dairy-herd work may well embrace observation of the effect of long-continued pear-feeding upon the progeny, and trial of prickly-pear as a constituent in the dietary of calves and growing stock.

EQUIPMENT AND METHODS.

Feeding operations are being conducted at a site abutting on the main Western line, 1 mile on the Roma side of Wallumbilla, and so situated as to make available pear both from box and sandalwood forest and brigalow and belah scrub.

The main buildings consist of a feed-preparation shed and a feeding-shed connected by means of a trolley-way for the ready conveyance of fodder to the feed-boxes. The equipment of the feed-preparation shed consists of appropriate scales for apportionment of rations and an engine-driven pear-cutter.

The experimental animals are stall-fed, and the rations weighed, for, since prickly-pear is on trial as a feed and component of stock rations, it is essential to accurately ascertain the amounts consumed both of pear and other feedstuffs given.

In their relation to problems pertaining to the natural grazing of pear it is considered that the data secured in stall-feeding are applicable; while the method constitutes actual trial of pear in rations for hand-fed stock. It is not, however, primarily sought to demonstrate that stall-feeding is possible at a profit for the class of cattle at present on the Station, although at the outset it did not appear impossible that

under certain conditions the utilisation of pear as the main constituent of stall-fed fattening rations might not prove economically feasible—the principal condition being the provision of the major portion of the nutriment by inducement of sufficiently high pear consumption.

The cattle at present under experimental treatment consist of 18 head of young bullocks or mature steers purchased in open market, and not noted for any special capability as pear-eaters. Consisting, as it is thought, of a good average class of beef stock, the data secured with bearing on the edible and nutritive properties of pear obtained with them should be of general applicability.

Progress of animals under each system of feeding is recorded by daily weighing and observation of such signs of welfare or depreciation as become apparent.

A small laboratory building—in which the work of chemical control of rations and investigation of composition of edible shrubs is being carried out—is situated on the cultivation paddock set aside from the Police Department reservation and adjoining the Wallumbilla water reserve. Adjacent is a watering-shed in which are installed a series of graduated drinking troughs, supplied by an overhead tank, for the estimate of water requirement and inquiry into questions related thereto, the water supply, also, being designed to meet the needs of the dairying operations in 1917.

Provision is also being made for the ensuing dairy work in the storage of ensilage and growing of hay crops.

The Station is, however, not intended for the demonstration of agricultural methods. Nor is it pretended that the minutiæ of the stall-feeding adopted are entirely suitable to ordinary farm practice. For the purpose of investigation, however, the exact weighing of rations is essential and the methods of handling most convenient. With the establishment and demonstration of correct principles in pear-feeding, the adoption to ordinary practice can be made to suit individual circumstances; to which, generally, the recommendations subsequently made as to treating pear for hand-fed stock, considering economy and convenience, will apply.

The additional feeds employed must be taken as representative of classes rather than as in all cases most recommendable or convenient of employment. Thus, the linseed meal or cocoanut cake in use are typical of the class of concentrated foods; lucerne hay of leguminous hays; wheaten hay of non-leguminous hays or roughages of general utility. The question as to whether better results will be obtained with one concentrate or the other, or of one legume or the other, involves rather comparison of the merits of individual adjunct feeds than the question of the general utility of pear.

The important problem of how, in the face of often adverse climatic conditions, feeding-stuffs adequate to the effective economic utilisation of pear cattle rations can be farm-grown is a branch of inquiry that might usefully follow the present investigation.

THE PRICKLY-PEAR STOCK FEEDING EXPERIMENT STATION, WALLUMBILLA.

The Director of Agriculture, Mr. H. C. Quodling, paid a visit on the 28th instant to the Prickly-pear Stock Feeding Experiment Station at Wallumbilla, and states that the work of the chemist in charge, Mr. F. Smith, B.Sc., has been advanced sufficiently to enable certain deductions to be made in regard to the pear consumption of animals and the effect of pear diet alone, and in conjunction with minor quantities of supplementary foods.

It was decided in the first instance when the Department initiated the experiments to attempt to establish certain data on which the successive work of the Station would be based, and for this purpose an average lot of young bullocks were taken and divided accordingly into groups, the contention being that this class of stock would not be influenced to the same degree that female or dairy stock would be, by functional derangement, different periods of lactation, &c.

Eighteen animals are being dealt with, and, excepting the small group which was kept exclusively on a pear diet until it was proven that they began to waste, the remainder have settled down to their altered circumstances and show a thriftiness and contentment consistent with individual temperament and ability to feed.

Several animals when taken in hand at first were wild and untractable for a few weeks and would not eat, which resulted in individual losses of from 150 to 200 lb. live weight; however, this has given place now to an ordered routine in which the animals occupy their own set of feeding stalls, and, when let out again, await their turn at the weighbridge prior to being put out into a small bare paddock, where they camp contentedly under the shade of the trees until brought or called up again for their next meal.

The experimental work has so far dealt with the utility of pear in maintaining condition in animals, without unnecessarily producing increase. This is a problem with which numerous cattle men would have been satisfied to have secured a cheap and satisfactory solution of during the recent disastrous drought.

Owing to the recent seasonable improvement, the pear is undoubtedly more succulent and possibly more acceptable to cattle than it was. Boiling or roasting is usually adopted by users of pear to soften the spines and render them innocuous, but at the Stock Feeding Station no previous preparation has so far been given to the pear, which is simply put through a slicer, similar in character to a pumpkin or turnip slicer, and this process reduces it to a form in which it is readily consumed without, so far, any deleterious effects. One thing of which notice must be taken is the fact that in the comparative maintenance trials, the group of animals fed solely on picked scrub-pear were unable to maintain themselves for more than a very limited period before commencing to show a rapid loss in weight and evidence of deficient nutrition in stariness of coat and appearance and general unthriftiness.

The ability of succulent pear to provide sufficient water, at least in the cooler portion of the year, has been demonstrated in the present experiments by the fact that the bullocks have not had any water for four months, and still show thrifty condition and no noticeable desire to look for water; this may be explained by the fact that animals receiving a minimum amount of pear are provided through that medium with an amount of water equal to from 4 to 4½ gallons per day. The inability of animals to exist on pear alone has been referred to. On the other hand, the use of minimum amounts of ordinary hays with pear has maintained weight, but resulted in a noticeable depreciation in appearance when compared with animals receiving additional food in the form of small amounts of leguminous (lucerne) hays and relatively small amounts of oil-cake concentrates, both of which tend to supply the food constituents in which the pear has been proved by analyses, conducted at the laboratory at the Station, to be deficient.

The estimated first cost for nutrients only to be added to a pear diet, simply prepared as it is done at present at the Station, works out at a little more than 2d. per head per day. Now that certain facts in connection with the preliminary trials have been so far proven, it is purposed to try and adapt the knowledge so gained, and put it to practical test, by giving small quantities and kinds of concentrate (so-called supplementary licks) to animals, which will be allowed access to pear under natural grazing conditions; due regard being given, of course, to the proper control and recording of the experiments.

The advantage of combining science and practice in this branch of experiment work is fully recognised, and the recording and summarising of the results for presentation to the public in an acceptable form are now occupying the attention of the Officer in Charge of the Station.

The cultivation and conservation of hay and ensilage crops for present and future use have been taken up. About 20 tons of silage—made from maize, sorghum, and Soudan grass—has already been conserved. Another 10 tons of fodder—barley and wheat—are now ready for the silo. A supply of ensilage will be needed in the near future when the dairying operations, the corollary of the present experiments, are commenced.

FOOTROT IN SHEEP.

By "CROWFOOT."

The disease known as footrot in sheep is of two kinds, contagious and non-contagious; the one contains a germ or parasite, capable of being transmitted by inoculation, and the other is so similar to it that it is often taken for the more virulent type. Non-contagious footrot, known as "dewscald," "fouls," &c., usually commences in or near the little gland or sack at the front of the foot and just between the digits; it contains the lubricant that keeps the digit space from becoming hard and liable to crack, but in wet seasons it gets clogged up with mud and herbage, and as the sheep's feet are continuously wet through not coming

in contact with the soil, the hoofs grow rapidly through having nothing hard to keep them worn down. Consequently they collect and hold much foreign matter, which ferments and causes intense ulceration, which if left alone spreads up under the hoof and affects the laminae of the foot. Pellets of mud also getting between the clefts of the foot, kneaded by the action of the hoofs in walking, and held there by the fine, short hair in the cleft, also produce a lameness resembling non-contagious footrot. It is cured by removing the pellet.

The pellet lameness occurs chiefly on Myall land, where the soil is very clinging in its nature, but this lameness does not constitute true footrot. The non-contagious variety cannot develop into the contagious any more than measles can develop into smallpox. "Dewscald" is caused by keeping sheep in wet, filthy yards or sheds, and on low undrained land. A wet season and tall, rank grass often produce it, especially if the hoofs are not kept closely trimmed so as to allow the free circulation of air between the cleft.

In the contagious variety the ailment spreads most rapidly during moist warm weather, such as we get during the spring; if it gets a good hold of many feet in such weather it is impossible to effect a cure, because the parasite multiplies so rapidly, and is so easily communicated. It can only be held in check until such time as the weather or season of the year will materially aid in effecting a cure. It also starts differently to the milder form, the starting place being the fringe of the hoof and usually towards the front of the digits, and spreads under the hoof up to the point of the toe, and along the side towards the heel; the hoof rises and eventually sloughs off. The coronet is the first start, similar to that recent disease known in America as horse footrot and gangrenous dermatitis. I have proved its contagion by slightly scratching the skin just where hair and hoof meet, sufficient to bring blood, and then rubbing some of the virus that exudes from a badly-affected foot on the wound. In three or four days, if weather conditions are favourable, you get the true thing, whereas with dewscald you get no result beyond a slight fomentation at the point of contact, which heals up rapidly.

Assuming footrot of any description to be contagious, it is always necessary as a first step to separate the diseased from the healthy sheep, or otherwise the whole flock may take it; this is very often the case, for as far as I can see only a very few flockowners take the precaution. Footrotty sheep should never be allowed to go on to sound country until thoroughly cured; some sheep are incurable, and it saves time and money to cut their throats and burn them. Again some sheep in a flock are immune, and, as a great deal lies in the formation of the foot, when culling this should be taken into account in country liable to be affected. A great deal depends on the kind of season, but once the disease gets amongst a flock it is much harder to cure than scab. Animals kept in a healty condition do not take it so readily as animals whose blood is in a bad state. A hospital paddock is very necessary, as it enables owners to isolate the disease, and the affected sheep can be worked at without disturbing the sound ones.

Once contagious footrot gets a good hold in a flock, it requires a great deal of care and patience to get rid of it, and unless adjoining owners are equally careful it will be labour in vain. It takes about seven days to develop, and death takes place from starvation before it runs its course, as the sheep if attacked in all four feet cannot get about to feed if there is no attempt made to cure it. Footrot usually starts as an epidemic, but it must have warmth, moisture, and rank herbage. If these conditions are absent, we have little or no footrot.

With regard to treatment, first of all isolation is necessary, then dressing of the feet, if it is only a case of simple footscald. This can be done quickly by taking off all the overgrown and loose portions of the hoof with a sharp knife or secateurs, and then running the sheep through a trough containing well-mixed bluestone water or arsenic (the former for preference) at a temperature of 90 degrees, placing a little clean straw or wool in the trough to prevent splashing. For the more virulent cases hand dressing has to be done, and this is where the skill is required. All the ulcerated parts must be entirely denuded of hoof, without making the feet bleed too freely, and keeping them as near the natural shape as possible. The next process is either to cauterise or to cut off with a sharp pair of surgical scissors or a knife any considerable fungus growth.

Now what is the best cure? Well, I have found nothing simple or compound (and I believe I have used nearly every possible dressing a chemist's shop contains) to equal sulphate of copper or bluestone. Use a solution of this, say 8 oz. of bluestone to 1 gallon of water, made as hot as a sheep can stand in with comfort, and place it in a shallow tub or trough capable of holding say about four sheep. When four have been put in the tub take out the first, the feet by this method getting thoroughly saturated; then let them stand on a dry, clean floor for twelve hours before turning out. The sheep must be looked to as often as once in three days, in order that any bad cases can be washed and redressed, and so the cure will be effected. Once a sheep is thoroughly cured, every succeeding attack is less severe, should such occur again. Another advantage in the use of bluestone is that it nullifies the matter or virus which exudes from a diseased foot. A great many owners pin their faith to arsenic as a medicament, but I can only say, after very many years' experience of this disease, that arsenic only temporarily allays the complaint by creating a dry crust over the sore, with the result that in a week or two the sheep are as bad as ever. The instruments used must be constantly sterilised and kept thoroughly clean, or blood-poisoning will result. Also the knives must be kept very sharp, good work being impossible with a blunt knife.

For hand dressing a few bad cases, a good salve can be made as follows:—1½ oz. of aqua fortis, ¼ lb. bluestone, 1 oz. friar's balsam, one-third as much alum or salt as bluestone (alum best), and as much mutton fat or lard as is necessary to make a salve soft enough for application. Powder the bluestone and alum very fine, mix thoroughly, then add the aqua fortis. Mix until it becomes a paste, then add the friar's balsam, and afterwards the fat. The cure greatly depends on the paring,

as every part of the rot must be exposed for the salve to act upon. Where it is necessary to treat 1,000 head of sheep by hand, the great temptation is to turn an army of men into the operating theatre, armed with everything except the necessary skill to do the work efficiently, in order to get the work over quickly. I have repeatedly seen this kind of performance, with the result that 50 per cent. of the poor sheep have left the hands of the operators permanently maimed. Every toe vein cut means bumble foot, and in many cases necrosis of coronet.

Footrot is a wearying ailment to deal with, owing to the tediousness of the healing process, and it is also expensive if many sheep have to be dealt with. The operator must always be comfortably seated, so as to have a steady hand, and to give the patient a comfortable posture, in order that they may not be so liable to kick; efficient work cannot be done with the back bent in standing up. The way to hold a sheep, when seated, is to let the animal rest in the fork, with the left leg of the operator between the hind legs of the sheep, resting the foot firmly on the ground. This prevents struggling. Next take a firm hold of the hind foot on one side and treat that, and then deal likewise with the other. While the hind feet are being dressed, tuck the forelegs under the left arm, letting the arm from the shoulder to about the elbow rest slant-wise across the brisket in the way a shearer does when taking off the belly wool. This saves the operator from getting cuts, and allows him to fix his whole attention on the feet. The hind feet should always be done first, to save blood getting on to one's clothes. When the fore feet come to be done hold the patient in a less perpendicular position so as to bring the hand action well above the feet, and one leg can be left under the arm. After the whole four feet have been gone over, the sheep should be handed to the dresser. The operator must neither have to catch his sheep nor let it go; the catcher fills both offices. The reason for this is that capturing the sheep and turning it into the required position creates an unsteady hand, and a great thing in the paring of the diseased hoof is a sharp knife and a steady hand and wrist.—"Pastoral Review."

SHEEP ON THE COAST.

If any proof were wanted that sheep-breeding on the coast is a successful and paying business, and one eminently adapted for returned soldiers who intend going on the land, it is afforded by the experience of Mr. Munro Hull, Eumundi, who lately took up sheep-raising on his property. From his small initiatory flock of the crossbred Romney Marsh —as always advised for the coast districts by Mr. W. G. Brown, Instructor in Sheep and Wool—Mr. Hull obtained his first bale of wool, which was sold by Messrs. Dalgety and Co., the price obtained being 18¾d. This (Mr. Hull says) works out at 13s. for old sheep and 6s. for the lambs. Mr. Hull is so satisfied with this promising commencement that he is purchasing more sheep. Mr. Brown is of the opinion that sheep-raising on the coast is the very thing to give a more than good living to returned soldiers, who, however inexperienced, would quickly learn the business, having all the assistance of the experts of the Department of Agriculture and Stock to lead them to success.

Dairying.

THE DAIRY HERD, QUEENSLAND AGRICULTURAL COLLEGE, GATTON.

Milking Returns of Cows for Month of August, 1916.

Name of Cow.	Breed.	Date of Calving.	Total Milk.	Test.	Commercial Butter.	Remarks.
			Lb.	%	Lb.	
Queen Kate	Ayrshire	15 June, 1916	1,087	4·0	51·05	
Nina ...	Shorthorn... ...	24 June ,,	1,144	3·6	48·27	
Bluebelle ...	Jersey	22 June ,,	881	4·6	47·74	
Lowla II. ...	Shorth'rn-Ayrshire	6 July ,,	974	3·8	43·38	
Rosine ...	Ayrshire	5 July ,,	864	4·2	42·65	
Auntie's Lass	,, ...	4 April ,,	759	4·6	41·12	
Thornton Fair tta	Jersey	26 May ,,	692	5·0	40·83	
Lady Melba	Holstein	28 Oct., 1915	935	3·6	39·45	
Princess Kate	Ayrshire	21 June, 1916	832	4·0	39·08	
Iron Plate ...	Jersey	20 Jan. ,,	581	5·3	36·39	
Lady Loch II.	Ayrshire	17 Mar. ,,	682	4·4	35·32	
Cocoatina ...	Jersey	17 Mar. ,,	549	5·0	32·40	
Miss Belle ...	,, ...	1 Aug. ,,	483	5·6	31·99	
Constancy ...	Ayrshire	24 Nov., 1915	530	5·0	31·28	
Belinda ...	,, ...	27 Feb., 1916	678	3·9	31·02	
Lady Maid	Shorthorn... ...	26 Jan. ,,	641	4·0	30·09	
Mistress Bee	Jersey	21 Jan. ,,	502	5·0	29·62	
Twylish's Maid	,, ...	22 Oct., 1915	472	5·2	28·99	
Netherton Belle	Ayrshire	23 April, 1916	491	5·0	28·96	
Lady Margaret	,, ...	14 Oct., 1915	550	4·3	27·83	
Miss Mischief	,, ...	15 June, 1916	527	4·4	27·29	
Charity ...	Jersey	28 May ,,	497	4·6	26·92	
Lady Lark...	Ayrshire	24 June ,,	545	4·2	26·90	
Lady Spec...	,, ...	6 Jan. ,,	550	4·0	25·83	
Red Lark ...	,, ...	21 June ,,	537	3·9	24·58	
Violette's Peer's Girl	Jersey	8 Dec., 1915	340	6·0	24·16	
Jennie ...	Ayrshire	1 Nov. ,,	464	4·2	22·89	
Jess of Greystanes	,, ...	18 Oct. ,,	499	3·9	22·83	
LadyMitchell	Holstein	3 June, 1916	503	3·8	22·41	
Lerida II. ...	Ayrshire	12 June ,,	446	4·0	20·93	
La Hurette Hope	Jersey	17 Nov., 1915	305	5·6	20·20	

During the early part of the month the cows were fed on maize silage, but during the latter part of the month they were grazed on cultivated areas.

THE CHAMPION COW OF DENMARK.

A correspondent sends us the following:—"The event of the year in Denmark—that is, in a similar sense to the Melbourne Cup of Australia—is the announcement of the winner of the championship of the dairy cows. The data of the entrants are kept from 1st July to the following 30th June. The cows which are entered are placed at one of the large agricultural colleges for a whole year. Last year's champion produced 15,071½ lb. of milk, from which 880 lb. of butter were made. The average value of butter being about 1s. 6d. per lb., the income from this cow for the year was £66. She is indeed a champion dairy cow.

Poultry.

REPORT ON EGG-LAYING COMPETITION, QUEENSLAND AGRICULTURAL COLLEGE, AUGUST, 1916.

Nine thousand nine hundred and thirty-four eggs were laid during the month, an average of 136 per pen. Cowan Bros. win the monthly prize with 157 eggs. The following are the individual records :—

Competitors.	Breed.	August.	Total.
*T. Fanning	White Leghorns	133	603
*J. Zahl	Do.	143	587
*Mrs. J. Jobling, N.S.W.	Black Orpingtons	140	566
A. Howe, N.S.W.	White Leghorns	149	560
*Miss Hinze	Do.	152	554
*A. T. Coomber	Do.	146	548
G. H. Turner	Do.	146	535
*J. M. Manson	Do.	151	528
Dr. Jennings	Do.	149	525
*Dixie Egg Plant	Do.	130	524
W. Meneely	Do.	145	516
Geo. Tomlinson	Do.	143	497
T. B. Hawkins	Do.	137	496
J. R. Wilson	Do.	150	494
J. M. Manson	Black Orpingtons	145	482
*A. E. Walters	White Leghorns	145	479
*E. A. Smith	Do.	141	478
*J. F. Dalrymple, N.S.W.	Rhode Island Reds	150	476
W. Lyell	White Leghorns	134	472
*E. F. Dennis	Do.	141	471
S. B. Tutin	Do.	134	469
Geo. Prince	Do.	131	467
A. W. Bailey	Do.	130	457
Mrs. Bradburne, N.S.W.	Do.	147	456
Mrs. Munro	Do.	137	454
T. E. Jarman, N.S.W.	Do.	137	454
Cowan Bros., N.S.W.	Black Orpingtons	157	452
H. W. Broad	White Leghorns	147	450
T. Taylor	Do.	140	450
H. Jobling, N.S.W.	Black Orpingtons	137	449
A. F. Camkin, N.S.W.	White Leghorns	133	441
Kelvin Poultry Farm	Do.	147	439
R. Burns	S. L. Wyandottes	147	436
*J. H. Gill, Victoria	White Leghorns	140	436
*C. Knoblauch	Do.	133	436
*W. L. Forrest, N.S.W.	Do.	128	431
C. P. Buchanan	Do.	119	430
*Kelvin Poultry Farm	Do.	126	427
Mrs. C. Davis	Do.	128	425
F. Clayton, N.S.W.	Do.	132	424
*J. Anderson, Victoria	Red Sussex	119	422
*E. West	White Leghorns	126	421
P. Brodie	Do.	124	417
A. H. Padman, S.A.	Do.	133	416
*W. H. Knowles, junr.	Do.	141	411

EGG-LAYING COMPETITION—*continued.*

Competitors.	Breed.	August.	Total.
Mars Poultry Farm	White Leghorns ...	132	410
J. Gosley	Do.	122	407
King and Watson, N.S.W.	Do.	141	398
*J. H. Madrers	Rhode Island Reds ...	132	396
T. Fanning	Black Orpingtons ...	128	385
E. Pocock	White Leghorns ...	129	385
W. Purvis, S.A.	Do.	146	383
J. Anderson, Victoria	Do.	132	383
W. Hirst, N.S.W.	Do.	142	383
E. F. Dennis	Black Orpingtons ...	155	381
R. Burns	Do. ...	132	380
*J. W. Macrae	Do.	144	375
W. H. Forsyth	Do.	117	363
F. Clayton	Rhode Island Reds ...	132	363
J. G. Richter	White Leghorns ...	141	359
W. Becker...	Do.	146	357
Cowan Bros., N.S.W.	Do.	144	356
Mars Poultry Farm	Black Orpingtons ...	148	330
G. W. Holland	White Leghorns ...	117	319
L. K. Pettit, N.S.W.	Do.	114	300
Harveston Poultry Farm	Do.	133	290
F. W. Leney	Do.	136	277
W. Lindus, N.S.W.	Do.	115	261
H. Hammill, N.S.W.	Do.	127	257
A. T. Coomber	Sicilian Buttercups ...	112	253
Moritz Bros., S.A.	White Leghorns ...	136	240
F. W Leney	Rhode Island Reds ...	131	223
E. F. Dennis	White Wyandottes ...	104	210
Totals	...	9,934	30,785

* Indicates that birds are competing in single hen test.

RETURNS FROM SINGLE TEST PENS.

Competitors.	A.	B.	C.	D.	E.	F.	Total.
T. Fanning	104	110	108	107	94	80	603
J. Zahl	93	97	106	90	102	99	587
Mrs. J. Jobling	110	120	69	97	74	96	566
Miss Hinze	96	79	112	84	94	89	554
A. T. Coomber	100	104	95	74	83	92	548
J. M. Manson	72	113	82	81	103	77	528
Dixie Egg Plant	122	108	103	97	0	94	524
A. E. Walters	86	111	74	62	93	53	479
E. A. Smith	104	80	74	101	57	62	478
J. F. Dalrymple	81	65	104	46	89	91	476
E. F. Dennis	75	104	53	92	80	67	471
J. H. Gill	45	95	52	103	69	72	436
C. Knoblauch	81	72	61	60	80	82	436
W. F. Forrest	77	80	43	91	82	58	431
Kelvin Poultry Farm	68	57	78	53	95	76	427
J. Anderson	91	61	95	18	95	62	422
E. West	100	85	52	58	53	73	421
W. H. Knowles	76	58	74	52	75	76	411
J. H. Madrers	46	84	80	87	60	39	396
J. W. Macrae	35	98	82	53	46	61	375

WEIGHT OF EGGS, SINGLE HEN TEST. (Oz.)

Competitors.	Breed.	A.	B.	C.	D.	E.	F.	Average.
J. Zahl	W. Leghorns	2·15	2·15	2·00	2·05	2·00	1·90	2·04
Dixie Egg Plant ...	Do. ...	1·95	1·95	2·05	1·95	...	2·05	1·99
J. H. Madrers ...	R. I. Reds ...	2·00	2·10	1·90	2·30	2·05	2·35	2·12
A. E. Walters ...	W. Leghorns	2·05	2·00	2·20	1·95	1·95	2·05	2·03
W. H. Knowles ...	Do. ...	2·05	1·90	2·05	2·00	1·85	2·15	2·00
Mrs. J. Jobling ...	B. Orpingtons	1·90	1 95	2·15	2·00	1·95	1·85	1·93
C. Knoblauch ...	W. Leghorns	2·10	1·95	2 05	1·90	1·90	1·95	1·98
J. F. Dalrymple ...	R. I. Reds ...	2·00	2·20	2·00	2·25	2·25	2·25	2·16
J. M. Manson ...	W. Leghorns	2·10	2·20	2 30	2·25	2·25	2·00	2·18
Miss Hinze	Do. ...	2·05	2·30	2·25	2·00	2·10	2 05	2·13
E. F. Dennis ...	Do. ...	2·15	2·10	2·35	1·90	2·10	2·25	2·14
Kelvin Poultry Farm	Do. ...	2·00	1 80	2·05	2 20	1·90	2·10	2·01
E. A. Smith	Do. ...	2·00	2·05	2·25	2·15	2·30	2·05	2·13
J. W. Macrae ...	B. Orpingtons	2·05	1·60	1·95	2 10	2 00	2·00	1·95
T. Fanning	W. Leghorns	2·05	2·10	2 05	2·05	2·00	1·95	2·05
J. H. Gill	Do. ...	2 05	1·90	2·10	1·95	1·80	2·00	1·97
J. Anderson	Red Sussex ...	1·95	2·05	2·00	2·00	1·60	2·00	1·93
A. T. Coomber ...	W. Leghorns	2·05	2·10	1·95	1·95	2 20	2 05	2·05
E. West	Do. ...	2 00	2 25	2·20	2·00	2·00	2·40	2·14
W. L. Forrest ...	Do. ...	2·05	2·10	2·35	1·95	2·15	1·95	2·09

In all cases three or more eggs of each hen were weighed.

RESULTS OF WEIGHING EGGS FROM SIX HEN PENS.

Competitors.	Breed.	Average Weight per Egg	Competitors.	Breed.	Average Weight per Egg.
		Oz.			Oz.
A. T. Coomber ...	S. Buttercups	2·10	H. Hammill ...	W. Leghorns	2·00
P. Brodie	W. Leghorns	2·00	W. Lindus ...	Do. ...	2·00
S. B. Tutin ...	Do. ...	2·00	Mars Poultry Farm	B. Orpingtons	1·85
J. Anderson ...	Do. ...	2·15	F. Clayton ...	W. Leghorns	1·90
T. Taylor	Do. ...	1·95	Moritz Bros. ...	Do. ...	2·05
G. Tomlinson ...	Do. ...	1·90	A. F. Camkin ...	Do. ...	1·90
E. F. Dennis ...	B. Orpingtons	1·80	W. Becker ...	Do. ...	2·00
F. Clayton ...	R. I. Reds ...	1·95	E. E. Dennis ...	W. Wyandottes	1·60
Mrs. C. Davis ...	W. Leghorns	1·95			
J. G. Richter ...	Do. ...	1·90			
G. H. Turner ...	Do. ...	2·00	Harveston Poultry Farm	W. Leghorns	2·00
E. Pocock	Do. ...	1·95			
H. Jobling ...	B. Orpingtons	1·80	W. Purvis ...	Do. ...	1·95
H. W. Board ...	W. Leghorns	1·90	W. Lyell ...	Do. ...	1·95
F. W. Leney ...	Do. ...	2 05	R. Burns ...	B. Orpingtons	1·90
W Meneely ...	Do. ...	1·90	A. Howe ...	W. Leghorns	1·95
J. R. Wilson ...	Do. ...	1·90	L. K. Pettit ...	Do. ...	2·00
T. Fanning ...	B. Orpingtons	1·80	Mrs. Bradburne	Do. ...	2·00
Cowan Bros. ...	W. Leghorns	2·10	W. Hirst ...	Do. ...	1 95
A. H. Padman ...	Do. ...	2·00	R. Burns ...	S. L. Wyandottes	2·00
J. M. Manson ...	B. Orpingtons	1·70			
Mrs. Munro ...	W. Leghorns	2·00	T. B. Hawkins...	W. Leghorns	2·05
Geo. Price ...	Do. ...	1·90	Cowan Bros. ...	B. Orpingtons	1·95
W. H. Forsyth ...	B. Orpingtons	1 95	Dr. Jennings ...	W. Leghorns	1·95
King and Watson	W. Leghorns	2·05	T. E. Jarman ...	Do. ...	2·15
Mars Poultry Farm	Do. ...	2·05	J. Gosley ...	Do. ...	1·90
A. W. Bailey ..	Do. ...	1 95	Kelvin Poultry Farm	Do. ...	1·85
G. W. Holland ...	Do. ...	1·95			
F. W. Leney ...	R. I. Reds ...	1·95	C. P. Buchanan	Do. ...	2·55

The Orchard.

FRUITGROWING AT LANDSBOROUGH.

Mr. R. E. Swan, president of the Ratepayers and Fruitgrowers' Progress Association, sends us three more photographs, evidencing the progress of the fruit industry in and around Landsborough. These, taken at Mount Mellum, within a 3-mile radius of the township, show how this district has progressed since the day when the editor of the "Q.A.J." spent a week with the late Australian explorer, Mr. Landsborough, at Caloundra. The impression left on our mind at that time was that the district was merely a sand heap, and covered with poisonous herbs which

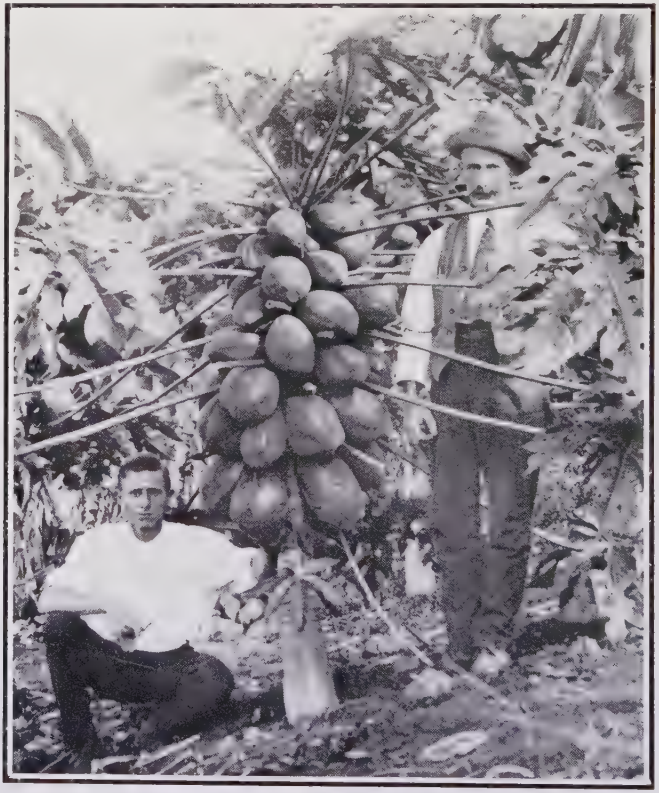


Plate 31.—Nine-months' old Papaw-tree at Landsborough.

destroyed a couple of thousand of Mr. Landsborough's sheep. To-day all is changed. Sheep thrive on the coast. Fruit-growing is a success, and generally the whole district has come to the front—so much so that, at the late Exhibition of the National Association at Bowen Park, the local Progress Association, for the first time in the history of the place, furnished a District Exhibit in conjunction with the No. 6 section of the North Coast exhibits.

PLATE 32.—STOOL OF BANANAS GROWN ON MR. VERNEY'S FARM WITHOUT THE AID OF FERTILISERS DURING EIGHT YEARS.

PLATE 33.—BANANAS ON G. CARRINGTON'S FARM, LANDSBOROUGH.

Our illustrations show a papaw tree in full bearing on Mr. A. Stephens's land, planted out in December last. The second is a view of bananas on Mr. Geo. Carrington's farm, of which Mr. C. Ross, Instructor in Fruit Culture, said that he saw none better for size and quality in the fruit-growing districts of Queensland. The third is a view of a stool of bananas growing on land which has been under the same crop for over eight years without the use of manure or any fertiliser. This property is owned by Mr. Robert Verney, who has over 20 acres under bananas.

There are, in all, about 120 acres in the 3-mile radius planted with bananas, mostly in full profit. The pioneers of this profitable industry at Landsborough were the Messrs. Skerman and Verney.

STOCKS USED BY THE CHINESE.

The problem of finding congenial stocks for our cultivated fruit trees is still in an experimental state, for certain stocks which have been proved to have been very successful in Western Europe when tried in America or Australia have proved failures in many instances. Included in a recent report of Mr. Frank N. Meyer, Agricultural Explorer attached to the Office of Foreign Seed and Plant Introduction, U.S.A., there is an interesting description of the stocks used by the Chinese.

It is in a country like China, with her great extremes of climate, that Mr. Meyer hopes that a partial solution of this stock problem will be found. The report proceeds:—

"One of the first things which attracted my attention was that, in the nursery gardens near Tientsin, I found that the Chinese gardeners had grafted flowering plums upon a stock which resembled an almond; also, chrysanthemums on the wormwood (*Artemisia* sp.), tea olives (*Olea fragrans*) on privet, and junipers upon the arbor vitae (*Thuja orientalis*). These facts showed me at once that the Chinese—in North China, at least—had tried to find congenial stocks which had root systems that were better suited to dry and alkaline soils than were the root systems of the plants themselves.

"One of the plants which most impressed me was the Almond-like stock. On asking the Chinese gardeners what they called it, they gave me the name of "Shan tao shu," which means literally "Mountain Peach Tree." This name suggested the possibility of this stock being the original wild peach. Upon inquiry where this could be seen, I was informed that it grew wild in the mountains, but there were many specimens to be found in the gardens of Tientsin and Peking. Upon being shown a specimen I found it to be the *Amygdalus davidiana*, originally discovered by Father David. This turned out to be a new stock never before employed by any of the Caucasian races, although seemingly in China it has been used for centuries as a stock for various stone fruits. It has even been introduced into various European and American botanical collections. After some difficulties seeds were procured of this Davidiana Peach, by which name it has come to be known in this country, and these have been tested in various places in

the United States, as Chico, Cal.; Ames, Iowa; and San Antonio, Texas; and, strange to say, they have proved hardy on the northern edge of the Peach belt of Iowa, and drought and alkali resistant in Central Texas, Arizona, and California. It seems as though it would play an important part in the development of the stone-fruit orchards of the country.

"While these furnish examples of the stocks already used by the Chinese, numerous wild plants, especially among the stone fruits, show promise of being valuable as stocks, and experiments with these now are being carried on in the United States to determine their relative value."—"Fruit World."

RED OIL FOR THE RED SPIDER.

Certain fruits are attacked more seriously by Red Spider than others. Almonds take the lead, yet but few of our cultivated trees are immune or sufficiently virile not to show evidences of attack. Prunes, plums, peaches, apples, pears, and cherries all suffer, and all require careful attention; for this pest can be kept in check, though, because the number of its host plants is legion, there is little hope of its extermination.

The surest remedy is an application of Red Oil emulsion, either during the winter or early spring.

Recent experiments have shown that late spraying is both feasible and effective. Oils applied when the fruit buds are swelling have a wonderfully stimulative effect upon the tree; and their application at this time is most effective against the pest. A further advantage is that the twigs are still greasy when the young mites are emerging from the egg, and the tiny creatures cannot settle or thrive upon greasy surfaces.

The remedy lies, therefore, within your own hands; and the fault and loss are your own if you neglect it.

If, through misadventure or carelessness, Red Spider is found upon the leaves during the summer, a lighter-bodied oil may be used, but this must be plentifully mixed with soap to make its application safe.—"Farm Journal," Sydney.

QUARTER ILL; OR, BLACK LEG.

In a Leaflet published in the "Journal of the Board of Agriculture," Volume XXIII., No. 3, June, 1916, on the "Occurrence, Symptoms, and Treatment of Black Leg," it is stated, under the head of "Treatment":—"No form of medical treatment has been discovered which can be relied on to cure blackquarter. Certain remedies have been widely advertised, but they have all proved valueless. Some success has ben claimed in the past for the method of treatment which consists of incising the swellings and dressing the wounds with antiseptics. This method, however, is now seldom adopted, for, if the patient recovers, as it very rarely does, a large area of tissue sloughs, and the convalescent period is, in consequence, long and expensive to the owner."

Viticulture.

WINE-GROWERS' CO-OPERATIVE WINE-CELLARS.

By G. A. GATTINO, Charleville.

In the September issue of this Journal I mentioned how the formation of Wine-growers' Co-operative Wine-cellars would bring great advantages to the farmer and economical benefit to our State and to the agricultural and wine industry.

I gave also a detailed review of all the purposes connected with such institution, and now I will explain the constitution of it.

It is not possible to deal fully with the particulars of the organisation, but I will offer you an idea of same.

The few members that desire to establish a co-operative wine-cellar have to form, before anything else, the rules and regulations of the Cellar itself; the articles which have to define the objects of the association, and the reciprocal rights and obligations of the co-partners.

These rules will have to include the following:—

1st—Classification-admission, succession, and the falling off of members.

2nd—The share of each member in the formation capital.

3rd—The share of each member in the maintenance of the Cellar.

4th—Distribution of profits.

5th—Advances on produce.

6th—Technical and administrative staff.

7th—Executive committee.

8th—Winding up.

9th—Eventual other dispositions.

We will not deal with the latter, which will vary in accordance with the circumstances in which the Cellars are formed, and will instead deal with the classing of members. The founders could be distinguished from the others, so as to give to the former some right to preferential benefits.

The admission and succession of new members and the falling off of others may be arranged by a member's proposal or by right of succession, and by the majority or the unanimous acceptance of the general meeting.

The Executive Committee will have the complete direction of the business of the Cellar, the right of accepting, refusing, or modifying what the Technical Director could propose *re* new methods, and in this case they will give the reasons of their decision to the general meeting.

This Executive Committee will consist of one president and two or four members—depending upon the importance of the Co-operative.

The technical and administrative staff will be constituted by one director and cellarmen.

The duty of the first will be to manage the preparation of wines belonging to the Cellar, and to allocate these preparations in accordance with the qualities of the grapes and the requirements of commercial exigencies. While of small importance, the director will have to keep the books of the Co-operative.

The principal articles of the Co-operative are, however, those which will regulate the contribution of each member to the formation-capital and to the maintenance of the Cellar, and especially in the distribution of profits.

It is evident that the chief principle to adopt in the abovementioned articles will be, that the one who delivers more and better produce to the Cellar will secure more profit, and pay proportionately more for maintenance expenses.

This general principle, although easy looking, is not, however, too easy in application, and as it requires long and complete explanation, I purpose to deal with this in next issue of the Journal.

ARTIFICIAL TEETH FOR HORSES.

The Veterinary Editor of the "North British Agriculturist," in reply to an inquiry *re* the use of artificial or false teeth for horses, gives the following:—"We may state that many years ago we put an artificial tooth into a horse, and since then we have put in several, mostly in the upper jaw and particularly the molar or back teeth. It occasionally happens that some hard body, such as a piece of stone or metal, may have accidentally got into the corn, particularly foreign oats, and the horse, when chewing, gets the foreign substance between his molar teeth, and unfortunately splits one of the teeth into two or more pieces right from the crown to the root of the tooth. When this occurs, the horse drops off his feed and runs at the mouth. It so happens that the bottom of the tooth socket may be damaged, when there is a fœtid or stinking discharge from the nostril. When this is the case, the broken pieces have to be extracted. We have several good specimens beside us. After removing the fragments, we plug the tooth cavity with cotton wool saturated with some antiseptic. That is done every third day for a fortnight, after which we put in the artificial tooth, which is nothing more or less than 4 oz. of gutta-percha, put into hot water until it can be moulded into the shape required. This we press firmly into the tooth cavity, moulding with the fingers the crown until it is level with the crowns of the other teeth. It soon sets and remains firm. A third upper molar tooth is in front of us, which measures from crown to root 3½ in. The root itself is 2¾ in. long and 1 in. square, so that when it is removed it leaves a very big hole, which gets full of food and becomes fœtid and troublesome. The gutta-percha tooth prevents this, and the animal, as a rule, does well. Moral.—In examining horses as to soundness, always examine the teeth.

Apiculture.

DO BEES INJURE FRUIT?

Again we are asked this question first propounded to us and replied to in this Journal in 1899. Since that time we have, in reply to correspondents, published thirteen articles dealing with the subject, all going to show that exhaustive scientific and other experiments have distinctly proved that, so far from injuring the fruit in an orchard or vineyard, the bee is the fruitgrowers' best friend.

Why do our Queensland orchardists and apiculturists not study this question for themselves, seeing that they have exceptional facilities for experimenting? It is natural to suppose that they are as competent judges as American fruitgrowers. The latter, however, differ from the Queensland growers, in that they are constantly investigating for themselves, not resting content with an appeal to the entomologist, and they are only too glad to publish the results of their investigations in the American and Canadian Agricultural Journals. They make experiments in api-, agri-, horti-, and every other culture—they invent little labour-saving appliances, and give them to the world. We seem to be content to follow where they lead. We rarely take the initiative. This is not as it should be. Our agriculturists are quite as intelligent as any in the world, as witness the small farmer who, years ago, invented the first combined corn-husker and sheller ever seen in Queensland, or the man who invented the cane-planting machine in the year 1900 (Mr. Pryce Treva, of Bundaberg). Mr. Treva exhibited his machine at the August Exhibition of the National Association at Bowen Park, and planters who had adopted it stated that it would do the work of thirty men and effected a saving of 10s. per acre—a very important saving in those days of low wages. What is the saving to-day, a day of abnormally high wages demanding the substitution of machine for hand labour?

We should like to see our farmers study things out for themselves, and give the results to the many newspapers which gladly give space to such matters. Any entomologist knows that the antennæ of the bee are incapable of cutting into the skin of sound fruit, and in order to make a start he must first find a hole already made by some other insect, such as the ant or the fruit fly. Yet it is quite true that the bee will bite through the wooden division boards of a hive.

This point was once raised at a meeting of a beekeepers' association, and an explanation was demanded. A bee expert present answered by asking the question: "Why is it that, although a man can bite through a piece of plaster, he cannot make a hole with his teeth through a plaster wall? Yet you say you have seen bees which looked as though they were searching for a weak spot on sound fruit, on which to make an

attack, although you very cautiously add that you did not see them actually succeed in piercing the fruit. Bees, although possessed of instinct in the largest degree, are very stupid in many things, and one may often see them trying for hours to do something, which, if they had any reasoning powers, they would have known to be a physicial impossibility. But there is no need to confine ourselves to theory only. The practical test has often been made of placing absolutely sound fruit in the vicinity of bees, care having been first taken to examine the fruit microscopically to see that it was uninjured. In every case, although the bees have hovered around, they have ultimately abandoned it untouched."

A large beekeeper stated that the fruit crop on a farm near one of his apiaries was worth £100 a year more than it was without the bees.

In 1898 the hon. secretary of the Queensland Beekeepers' Association sent us the following notes by Mr. D. Jones on the above subject:—

"While visiting a suburban gardener a few days since, complaint was made to me of bees injuring last year's crop of grapes. This matter cropped up some years ago at a meeting of the Brisbane Horticultural Society, when the matter was fully discussed, and a complete refutation given to the charge against our innocent bees.

"That they do take advantage of what otherwise would be waste fruit juices is a fact which establishes a sound law in the economy of Nature; for bees will only avail themselves of such fruit juices as appear on fruits already punctured by other insect depredators, such as fruit flies, birds, &c.

"In Queensland we often find, in certain seasons, grapes punctured by the fruit fly. This causes an exudation of juice which the alert bee is sure to seize on, with the result that he is charged as being the culprit originating the injury. Entomological study of the structure of the bee's mouth clearly demonstrates his inability to puncture or injure fruit by such a process.

"In the case of fruit-fly attack, the bees render practical service in restricting the reproduction of the fly, as, by reason of the thorough manner in which the bees drain the injured grape of its juices, they leave only skin which will not sustain the larvæ, if developed from the egg, originally deposited by the fly.

"Fruitgrowers may well look upon bees as their most valuable allies, particularly in Queensland, where so many new varieties of fruits are being experimented with, dependent, as many are, on prompt and perfect pollinisation, which, without the aid of bees, could not be successfully accomplished.

"In America some years since the question was fought out by an expensive lawsuit, when the verdict was emphatically in favour of our bee friends."

[The question of bees puncturing fruit has been frequently discussed in this Journal, and we showed by conclusive evidence that, as Mr. Jones says, not only does the bee not injure fruit, but that the insect is the greatest friend of the orchardist.—Ed. "Q.A.J."]

In a late issue of the "Farm Journal," Sydney, we find the following note on the subject:—

"Every fruitgrower must either keep bees or get his neighbours to do so, and he will be surprised to find not only a finer quality in his fruit, but a much higher yield per tree.

BEES DO NOT INJURE FRUIT.

The orchardist need not let the old fallacy about the bees destroying and eating his fruit worry him, as test cases in the highest courts have proved the fact that bees do not injure sound fruit, but extract the juice from it after birds and other enemies have injured it. Hundreds of fruitgrowers in the United States grant free pasturage to beekeepers solely for the benefit they derive in the fertilisation of the fruit trees. I will conclude by saying:—"Keep bees and lots of them"; and the little labour entailed will be amply repaid, with also a bonus of honey for your own use or for sale."

CANARY SEED.

"T.W.G.," Clifton

1. For bird food.

2. This is a question which should be referred to a medical adviser.

3. Yes. A heavy crop of canary grass will often yield over 3 tons of hay, and the young crop may be grazed off by sheep, provided they are not kept on it too long, particularly when late in the season. The straw makes excellent chaff.

4. A canary-seed crop can be harvested in the same way as a wheat crop, and may be threshed out by a wheat-threshing machine, taking care, however, that the machine is in charge of a man who thoroughly understands the setting of the machine, to avoid skinning and crushing the seed on the one hand, and leaving a quantity of seed in half-threshed heads on the other. Where wheat is not grown, and consequently no threshing machines are used, it would not pay a farmer to buy a machine for a small crop. He could only make use of the old-fashioned flail.

Statistics.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

Table showing the Average Rainfall for the Month of August in the Agricultural Districts, together with Total Rainfalls during August, 1916 and 1915, for Comparison.

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Aug.	No. of Years' Records.	Aug., 1916.	Aug., 1915.		Aug.	No. of Years' Records.	Aug., 1916.	Aug., 1915.
North Coast.	In.		In.	In.	*South Coast*—continued:	In.		In.	In.
Atherton	0·87	15	0·73	Nil					
Cairns	1·85	34	1·64	0·06	Nambour	1·89	20	4·54	1·84
Cardwell	1·26	44	2·79	Nil	Nanango	1·51	34	1·25	1·42
Cooktown	1·46	40	0·93	0·23	Rockhampton ...	0·92	29	2·03	0·41
Herberton	0·64	29	0·79	Nil	Woodford	1·98	29	2·97	1·22
Ingham	1·34	24	2·36	0·04					
Innisfail	5·27	35	3·08	0·43					
Mossman	1·25	4	1·82	0·34	*Darling Downs.*				
Townsville	0·41	45	0·63	0·53					
					Dalby	1·26	46	2·01	1·18
					Emu Vale	1·25	20	1·96	1·72
Central Coast.					Jimbour	1·36	28	1·12	2·25
					Miles	1·30	31	1·33	1·51
Ayr	0·38	29	0·63	0·38	Stanthorpe ...	1·95	43	2·26	1·60
Bowen	0·63	45	0·92	0·51	Toowoomba ...	1·83	44	2·22	1·54
Charters Towers ...	0·37	34	1·91	Nil	Warwick	1·55	29	1·92	1·76
Mackay	0·98	45	0·85	0·88					
Proserpine	0·89	13	0·72	0·99					
St. Lawrence ...	0·89	45	1·17	0·40	*Maranoa.*				
					Roma	0·97	42	1·56	1·45
South Coast.									
					State Farms, &c.				
Biggenden	1·18	17	2·42	1·82					
Bundaberg	1·43	33	2·36	1·31					
Brisbane	2·27	65	1·73	1·60	Bungeworgorai ...	0·68	4	1·51	1·20
Childers	1·26	21	2·00	0·48	Gatton College ...	1·33	17	1·79	1·62
Crohamhurst ...	2·27	23	5·19	1·86	Gindie	0·66	17	1·06	1·29
Esk	1·70	29	1·53	1·99	Hermitage ...	1·53	10	2·13	1·98
Gayndah	1·26	45	2·04	1·32	Kairi	0·74	4	0·55	Nil
Gympie	1·89	46	3·88	1·47	Kamerunga ...	1·51	26	2·08	0·05
Glasshouse M'tains	1·62	8	3·14	1·45	Sugar Experiment Station, Mackay	0·77	19	1·30	1·05
Kilkivan	1·62	37	2·41	1·23	Warren	0·12	3	...	0·18
Maryborough ...	1·79	45	2·66	1·21					

Note.—The averages have been compiled from official data during the periods indicated; but the totals for August this year and for the same period of 1915, having been compiled from telegraphic reports, are subject to revision.

J. H. HARTSHORN,
Acting Divisional Officer.

Botany.

ILLUSTRATED NOTES ON THE WEEDS OF QUEENSLAND.

By J. F. BAILEY, Government Botanist, and C. T. WHITE, Assistant Government Botanist.

No. 5.

SIDA ACUTA, Burm. (Order Malvaceæ).

An undershrub. Leaves nearly glabrous, 2-3 in. long, linear-lanceolate, serrate, shortly stalked. Flowers yellow, on short stalks which are jointed about the middle. Carpels rugose, bearing two sharp spines.

It is somewhat difficult to say whether this species is a native or introduced. It is a widely-spread weed of tropical countries, and in its great similarity to *Sida rhombifolia* (more commonly known as *Sida retusa*) may have been passed over by general collectors in Queensland.

Specimens have during the past few years been received from various Northern localities. Mr. E. Jarvis, Gordonvale, near Cairns, says that it is a great pest, and the commonest species of *Sida* about there. In a recent visit to Townsville we noticed that this and *Sida cordifolia* were two of the commonest weeds of the district, the species now under notice being much more prevalent than the well-known and very similar *Sida retusa.*

The chief distinctions between these two closely-allied weeds are—

Leaves linear-lanceolate; peduncle (flower-stalk) as long as the petiole (leaf-stalk); carpels 5-9, rugose, spined.—*S. acuta.*

Leaves generally more or less rhomboid; peduncle longer than the petiole; carpels 8-10, smooth or reticulate, with or without terminal spines.—*S. rhombifolia* (*S. retusa*).

In the field the former can be told by its livelier green colour and general appearance.

Uses.—Though a noxious weed, the following extracts show it to have some economic uses:—

"The stems yield a good fibre. The natives make brooms, with which they sweep their houses, of the stems of this and allied species, gathering them afresh each morning. In the Philippines, according to Padre Blanco, poultices are made by boiling the leaves, and are applied to ulcers and other sores. In India a tonic is made from the plant which is said to be a good appetiser."—W. E. Safford, "The Useful Plants of the Island of Guam."

"The root resembles common liquorice, but is very bitter. The infusion of the root combined with ginger is given in intermittents and in chronic diarrhœa. The leaves bruised with oil are used, applied externally as a poultice to accelerate suppuration. An infusion of the root is a very useful bitter tonic and astringent."—G. E. Balfour, "Cyclopedia of India."

Eradication.—In small areas hand-pulling or cutting off below the surface of the soil is the most effective method; in larger areas where the plants are growing thickly together, spraying with any of the weed-killing preparations obtainable at the shops should be successful. The plants should be dealt with prior to seeding.

Plate 34.—Sida acuta, *Burm.*

Science.

SOIL ANALYSIS.

In the March (1916) issue of this Journal we published an article on the above subject taken from a Leaflet (No. 293) issued by the Board of Agriculture and Fisheries. In Volume XXII., No. 2, of the "Journal of the Board of Agriculture," a paper by E. J. Russell, D.Sc., Rothamsted Experimental Station, was published in which the difficulties of obtaining an absolutely reliable analysis of any given soil are pointed out. Mr. Russell wrote:—

"Analysis is the method adopted by the expert adviser for obtaining certain information about a soil. It includes chemical, physical, and bacteriological investigations; and it may be accompanied by more general field observations for the purpose of discovering the nature of the subsoil, of the water supply, and of the climatic and other conditions important for the growth of plants.

"A full investigation of this kind is found to be too laborious for ordinary use, and in practice shorter methods are commonly necessary. These do not aim at giving a complete account of the soil, but they express the amounts of certain substances present which are known to have an important effect on the crop production. Experience has shown, however, that these methods are at their best when used for purposes of comparison, and as far as possible they should only be applied in this way. The analysis of a casual sample of soil from a district of which the analyst has no intimate knowledge is a much more difficult affair, and is often unsatisfactory both to him and to the farmer. Indeed, from the farmer's point of view, the question as to whether a soil analysis is worth conducting depends very largely on the possibility of making a comparison with some similar soil about which definite knowledge has been obtained by field experiments.

"Fortunately, this country is now provided with organised schemes under which such systematic field experiments may be made and the results recorded; the possibility of setting up comparisons is therefore steadily increasing.

"HOW A SOIL ANALYSIS MAY BE USEFUL.

"In at least three distinct cases useful help can be given by the soil expert—

(1) The simplest case arises when a farmer wants to know whether he has any reasonable chance of obtaining results similar to those demonstrated by field experiments on another farm in his locality. Where, for instance, such experiments have demonstrated the advantage of applying lime, phosphates, or potash, the expert can with considerable accuracy say whether similar results can be obtained on the farm in

question. He cannot be absolutely certain, as there is always an unknown factor, but the chances are that he comes out right. There is no doubt that much more use might be made of field experiments in this way with considerable gain both to farmers and the officers advising them.

(2) Another comparatively simple case arises when a farmer wishes to adopt some system of cropping or soil treatment known to give good results elsewhere in the locality, but before embarking on the change he desires to know how far his soil conditions resemble those where the method works well. Here examination may reveal some difference which, while not very obvious to casual inspection, is of vital importance to the success of the enterprise. Two heavy soils, for instance, may look very much alike, but one may owe its heaviness to very fine particles and the other to silt particles. Methods that succeed in one case have often failed in the other. If the farmer is aware of the difference, he can make his plans accordingly.

(3) The problem is rather more extensive when a man is entering on a new farm and wants to obtain as complete information as possible about the soil. Here the farmer must remember that no one person can possibly give him all the information that could be gleaned; chemists, bacteriologists, physicists, could each say a good deal without exhausting the subject. A selection has to be made, and much time is saved where an interview can be arranged on the spot with the expert consulted, who can then ascertain exactly what information is wanted. Most farmers feel that they have a bent for some special branch of production, and they naturally wish to exercise their powers in the right direction.

"On the other hand, many soils have some special feature fitting them for some particular crops better than for others. A certain amount of accommodation is possible on both sides: The farmer may alter both his scheme and his soil, and the best results cannot be obtained till the process is complete and the scheme made to fit the possibilities of the soil. This end may be and often is attained by the costly and bitter method of experience; it can, however, often be reached more quickly by securing the services of the expert. In the first place, an investigation will show whether the soil and the general conditions resemble those obtaining where the proposed system of husbandry is known to be a success. It may reveal the more important differences and enable the farmer and the expert to discuss methods by which they may be overcome. Secondly, a comparison of the results with others obtained in the locality will show the expert to what type the soil belongs, and he can then inform the farmer what systems of farming are known to succeed on this type. Thus the materials for a comparison can be got together. Although no one would pretend that anything like complete information could be obtained in this way, it is certain that money and valuable time can often be saved.

"DIFFICULTIES.

"The problem becomes much more difficult directly the soil expert gets away from comparisons and is asked to make an absolute pronouncement on a sample of soil considered by itself. Of course, if he has considerable local knowledge, or if a soil survey of the district has been made, he may discover a standard of comparison, and then matters proceed tolerably smoothly. Failing this, he feels that his ground is very uncertain; he has to try and put some absolute value on the quantities obtained by analysis, and in interpreting the results a good deal of balancing of probabilities becomes necessary. This is always a delicate business, and is likely enough to miscarry.

"Still more difficult is the case when the farmer does not ask for definite information on specific points, but puts the general (and natural) question—How can I manure my land at greater profit than I am getting at present? Although every farmer must ask himself this question, he will, after careful thought, quickly realise that it is much too complex to be answered off-hand. The analyst may be able to report that similar soils under similar conditions have given satisfactory returns for the application of certain manures to certain crops; but the question whether equal returns would be satisfactory on the farm in question depends on many other factors—the amount of capital available, the market facilities, the general economy of the whole farm, &c.—and a satisfactory answer can usually only be obtained when the whole question has been discussed by the farmer, the agricultural expert, and the soil expert. Short of this, the best method is for the analyst to suggest two or three systems of manuring, and for the farmer to give them as good a trial as possible before making the final selection. This problem, of course, becomes more and more easy as the number of analyses is multiplied, but it continues to be very difficult until the expert's work is well organised.

"CONCLUSIONS.

"The farmer who wishes to derive the maximum assistance from soil analysis must bear the following points in mind:—

(1) The simplest problem for the expert is to compare soils; and, therefore, the chances of success are greatest when a soil survey has been made or when some similar soil has been under proper field experiments.

(2) The object of the analysis is to furnish information; but no one has the time, even if he had the power, to set out all that can be discovered about a particular sample of soil. The farmer must, therefore, arrange to go over the land with the expert and discuss on the spot the various points on which information is desired; the necessary samples can then be drawn with the proper tools and with all due precautions.

(3) Finally, it should be remembered that the problem is very difficult indeed when no satisfactory standards exist, and where the expert has not made a personal inspection; so much balancing of probabilities has to be done that no expert can give more than a general opinion, or do more than submit two or three alternative schemes for consideration and trial."

Entomology.

THE SPIDER OR TICK FLY OF THE HORSE.

HIPPOBOSCA EQUINA, LINNÉ.

By HENRY TRYON, Entomologist.

Introductory.

On 4th July, 1916, a correspondent (R.B.S.) forwarded from the Glass Mountains district, of Southern Queensland, a specimen of a fly previously unknown to him, writing regarding it as follows:—

"I have not before seen it. . . '. It is awfully severe on horses especially, and is extremely irritating. It seems partial to their ears. They are not as yet in evidence to any very serious extent."

On the receipt of this intimation, and of the specimen of the insect to which it referred, a letter, dated 7th July, was forwarded to this correspondent communicating the fact of the identity of the insect in question with *Hippobosca equina*, Linné, embodying briefly an account of the principal incidents of the life history of the species, its habits, its probable source (New Caledonia), and the treatment of horses threatened with it. ttacks.

This in due course R.B.S. communicated to the Brisbane Press, our letter being embodied in an article headed "A Flying Tick, Unwelcome Visitor to Queensland."—*Brisbane Courier*, 20th July, 1916.

In this article, evidently inspired if not penned by R.B.S. himself, the writer states: "It is feared (that) when the warm weather comes round again the evil will spread rapidly," and "being winged it has means of colonisation of a most alarming nature." "Mr. Shackleton's theory" [it adds] " is that possibly it may have been introduced into this country in its chrysalis state as a stowaway per medium of recent shipments from Argentina."*

In view of the discovery of this ecto-parasite, associated with the horse in Queensland, and its alleged significance, the following particulars regarding *Hippobosca equina*, Lin., may be of interest:—

Designation.

Hippobosca (*Fr.* Hippobosque); Spider Fly (*Fr.* Mouche araignée *Ital.* Mosca ragno); Flat Fly; Forest Fly; *Germ.*, Pferde Lauseffiege (Horse Louse Fly); Flying Tick or Tick-Fly.

The insect being a fly, and not a louse nor a tick, neither of those two latter terms should enter into its designation, except adjectively. The word "Forest," applied to it in England, has reference to its principal place of occurrence there, *i.e.*, the New Forest. "Flying Tick" has been bestowed upon it in Australia, exclusively; but the term Tick-Fly would more appropriately commemorate its systematic position, as well as also its parasitic habit.

*See also Tryon, H. The Tick Fly. *Queenslander*, Brisbane, 2 Sept., 1916, p. 35.

Systematic relations.

This fly belongs to a group of these insects that have not the proboscis characteristic of the majority of other Diptera, and that is therefore designated *Eproboscideæ*. It is also one of those flies that do not deposit eggs, and that although they give birth to young representing the next phase of insect life, or maggots, these are at an advanced age and ready to transform almost immediately. Hence, the section of flies including it is named *Pupipara.*

General Parasitic Habit.

The pupiparous flies are all associated as external parasites with warm-blooded animals, birds, or mammals, and sometimes their degraded habits have led to their being unendowed with wings, as in the common parasite of the flying-fox (*Pteropus* spp.), named *Nycteribia,* and the so-called sheep tick, or Ked (*Melophagus ovinus*). There are again flies of this group that lose their wings when once they have found their host. Such is the Hippoboscid met with upon the deer in Europe.

There are several kinds of these flies represented in the Australian fauna proper, they being found to occur on many of our birds, especially the larger ones, the birds of prey (eagles, hawks, and owls) quite commonly harbouring them. But the smaller members of our avifuma also possess "spider flies" of their own, *e.g.*, the Martin and the Emu Wren, amongst others. They occur, again, on our marsupials. Not only is there on these animals a very small one that may occur on wallabies, whose body scarcely exceed ⅛ in. in length, one of intermediate size that appears to be the *Feronia Macleayi,* Leach (more correctly *Ortholfersia Macleayi* (Leach) Speiser), but a quite large hippoboscid whose body length exceeds ¼ in., and is identical with the common *Ornithomyia* of birds of prey, the introduced *O. avicularia.*

The Hippobosca Spider Flies.

The *Hippobosca equina* (so named by Linné, in 1761, when writing on the fauna of Sweden) has apparently no congeners in Australia, although two Australian spider flies have been referred to Hippobosca (*H. australis,* Guérin, and *H. viridipes,* Walker). However, certain Australian Spider Flies, except by those who recognise nice distinctions, may be confounded with members of the genus *Hippobosca* as now understood, and even with the one now before us, *H. equina.**

There are about twelve different kinds of Spider Flies that have been referred to the genus *Hippobosca.*

The external parasites comprised in it are furnished by the faunas of Europe, Africa, Asia, and the East Indies. (It does not appear that any true Hippobosca occurs in the "New World.") They have for their proper hosts horses (*Hippobosca equina,* Linn.; *H. maculata,* Leach; *H. rufipes,* von Olfers), bucks, camels, dogs, and felines (*H. canina,* Rond.,

*In the "Agricultural Gazette" of New South Wales for December, 1900, a Spider Fly that has ocelli and an anal wing-cell has erroneously been named *Hippobosca equina,* that possesses neither of these features.

H. capensis, von Olfers), and—in Australia—marsupials; whilst a single species (*H. struthionis,* Janson) occurs on the ostrich.

They do not, however, exclusively occur severally upon these hosts, sometimes, indeed, fastening upon man himself. Thus Rondani mentions (1878, p. 164) that the particular Spider Fly now under consideration, *Hippobosca equina*, "vivit equiis, bovibus, canibus et aliis animalibus" (lives upon horses, cattle dogs, and other animals). Each different kind, however, appears to favour especially a single animal host.

Relation to their Hosts.

The Spider Flies are included in the group of Blood Sucking Insects, but an examination of the living object does not favour the view that they extract blood in quantity as does a Tick, a Gad Fly (Tabanus), a Biting Fly, *Stomoxys,* &c.) or a Mosquito; and, when they occasion annoyance to animals it is not as blood-suckers, with the resultant symptoms of anæmia, but as irritating insects productive of more or less pruritus.

Indeed, individual animals can tolerate their presence in quite large numbers without apparent inconvenience, whilst others are highly disturbed by their presence upon them.

In the new forest, the part of England where the insect now under notice (*Hippobosca equina*) is especially prevalent (wherefore it is named the "Forest Fly"), individual rough-coated ponies may literally swarm with the insect without yielding much evidence of sensibility of their presence, much less symptoms of ill-health; nor do we find that any wild animal or bird that harbours Spider Flies is ever in poor condition, unless there are circumstances explanatory of this, other than that yielded by the presence of their fly-guests.

Again, although there be a great deal of literature relating to these insects, little has been published on them from the purely economic standpoint. In fact, the late Miss E. A. Ormerod's comprehensive account of the "Forest Flies," written in 1895, is quite exceptional in this respect.

Description.

1. *The Fly.*—The *Hippobosca equina,* L., is a peculiarly flattened glossy insect having a distinctly tough, leathery constitution, and somewhat exceeding an ordinary housefly in size. Its head, broadly implanted in the mid-body, has two conspicuous oval black eyes (but no ocelli), and is directed horizontally forward. The two wings are very pale-brown, and partly covering one another reach backwards beyond the hind-body. These organs have a strong hairy rib extending along the fore-border, and the basal two-thirds of this costa receives four brown-coloured veins, of which the outermost two are united in a fork at about half the wing's length. Within the wing, and internal to these veins, are two others of the same colour; that falling short of the wing-border end in two short slanting cross-veins, and so enclose elongated discal-cells. There is no anal cell. The thorax, or mid-body, is large and broad, and is composed above of mesonotum and scutellum, the former having an impressed line crossing it, and a narrow groove passing down its centre. The hind-body or abdomen is bag-like, semi-oval in outline, with the hind-border

shallowly concave. The legs are short and are directed outwards, and each ends in two bifid claws; and the feet, being also endowed with special appendages of a very peculiar character, are singularly prehensile organs.* The head has its front deeply excavated, and from this hollow project two dark-coloured hairy plates or lamellæ; that, answering as palps, serve to conceal the so-called proboscis that lies beneath them. The feelers (antennæ) are very short, apparently unjointed, and have two terminal bristles of unequal length. They lie in little hollows, one on each side of the face. The fly is of a general brownish colour of varying intensity in different individuals, and has a pale spot above in the centre of the scutellum, and one on each shoulder in front of the wing-origin. There are bristle-like hairs occurring here and there, those on the thorax above occupying special areas only. The hind-body again has much more numerous shorter weaker ones clothing it. In size the insect varies, being usually rather more than $\frac{1}{3}$ in. from the front of the head to the tip of the hind body, and $\frac{5}{12}$ in. from the former to the end of the closed wings that extend beyond it. When parturition has taken place, however, or the insect is dead and dry, it is, of course, smaller. The Queensland specimen before us has the above measurements—7 mm. (or $\frac{1}{8}$ in.) and 9·5 mm. ($\frac{1}{4}$ in.), respectively.

2. *The Puparium.*—This is a very singular body that, as we are informed by writers on the subject of this insect, is usually regarded as an egg, and especially so, not only on account of its colour and form, but since it may be seen to issue immediately from the body of the parent fly. It measures about 2 lines (4 mm.) in length.

It is thus described by M. de Réaumur, writing in 1752:—"The egg-like body when deposited was white, with the exception of two projections at one end, the space between them, and some amount of the parts in the vicinity of the notch; the envelope hard and firm, and becoming still more so as it changed to a brown colour, and thence in about twenty hours to a shining black, when it could resist a considerable pressure."—*Transl.* E. A. Omerod, *Op. cit.*, p. 107.

Life History and Habits.

The Horse Spider or Tick Fly is a constant parasite of its host as are other Spider Flies in relation to those animals or birds that they especially affect. If it fly off its body it is only to make a short and rapid excursion to another part of it or to another animal close at hand, or when an effort is being made to capture it, or on the animal with which it is associated having died or been killed and someone is too suddenly approaching it. Accordingly, one seldom, if ever, encounters the insect upon the wing. When settling, or on being disturbed, it will slither through the animal's hair with remarkable rapidity, moving apparently with equal facility backwards, forwards, or sideways; and, when impelled to exercise additional activity, it indulges in a succession

* Miss E. A. Ormerod, in the Memoir already cited, issued in 1896, publishes two most excellent plates, drawn by Horace Knight, representing the elaborately constructed foot of *Hippobosca equina.*

of little short, but sudden, leaps. When at rest it appears to favour especially parts where there is little hair and the skin is comparatively tender and thin, especially about the perineum, at root of and beneath the tail, &c. Here it seems to feed not only on the blood which only to a small extent yields it its proper aliment, but also on the surface exudations of one kind or another. Apparently the mere insertion by the fly of its proboscis into the skin of its host in extracting blood irritates the latter, as a rule, but little; and when annoyance is felt by the horse, this arises from the sensation due to its sharp hook-like claws grasping tenaciously the hair of the skin or pricking this as it moves jerkingly over its surface. But, notwithstanding numerous individual flies may infest a single animal, this may occur—as has already been remarked—without the latter manifesting any special indications of discomfiture. On the other hand, horses that are not accustomed to its presence upon them, when visited by it, evince every symptom of extreme irritation and intense annoyance, kicking and stampeding about much worse even than when visited by the Horse Bot Fly (*Gastrophilus equi*). The historian of British Farm Insects (J. Curtis), writing on this subject, states as follows:—"By running over the delicate skin of the high-bred horse, it causes an insupportable irritation with its claws, which the rough-coated forest-pony almost disregards"—Curtis, J., 1855. On the same subject a recent writer (H. Bastin), after referring to the presence of the insect in the New Forest (England), also writes:—"It may sometimes be seen clinging in enormous numbers to ponies and cattle. Curiously enough, its bite appears not to cause pain, and beasts which have been bred in the Forest show no sign of annoyance, although strange horses are driven almost frantic by the irritation caused by the insects wandering over them"—Bastin, H., 1913, p. 188. The proportion between male and female individuals does not appear to have been recorded.

Union of the sexes—it is known, however—takes place whilst the flies are on the horse's body, and the period of gestation is comparatively long compared with that of other flies—generally speaking. This is accounted for by the following remarkable circumstance that may be narrated in the words of Miss Ormerod:—

"The important part in the life-history of this fly [she has written] is that, like others of the division of the *Pupipara* to which it belongs, the egg is hatched, and the maggot (or *larva*) feeds and is nourished up to maturity within the abdomen of the parent fly. When fully developed, this larva is deposited, not as an ordinary maggot, but as a *puparium*, or pupa-case, within which the larva is then completing its immediate change to the pupal or chrysalis state, and from which puparium the perfect fly emerges, it may be in about a month, or it may be after a much longer period, according to weather and other circumstances."*—Ormerod, E. A., 1896, p. 106.

* The researches into the method and progress of the young Spider Fly, first within the body of the mother insect and then within the extruded puparium, on which the above information—now a matter of common knowledge—is based, were carried out by the celebrated French savant (M. de Réaumur) in 1739-40, and are recorded in his "Mémoires," published at Paris a few years subsequently.—Réaumur, M. de, 1752.

Mons. E. Mossonat and C. Vinnet have pointed out (1913) that whilst the larva turns brown within 2 or 3 hours, the period passed by the insect in the puparium is dependent on temperature. This is from 28 to 35 days at 20° C. to 21° C. (68°-69° Fahr); but if kept at 35° C. (95° Fahr.) the period may be only 25 days; whilst a puparium kept at a high altitude required 50 days for emergence of the insect.

A Russian investigator (Professor Cholodkovsky), describing in detail the method in which the larval *Hippobosca* is nourished, when as yet unborn, states that this by means of so-called milk glands. (Milch drüsen).—Cholodkovsky, 1908, pp. 112-119.

Singular to relate—although a feature common to allied pupiparous flies—the Horse Spider Fly, although endowed with two ovaries, produces but a single puparium at a time; the development of its progeny, carried on to the extent that the attainment of this stage implies, making so great a demand on its procreative potentialities.

This egg-like "chrysalis," already described (*vide* pg. 270) has been met with on the soil, in crannies therein, and at the roots of grass; but the usual position of its occurrence has not, so far as we are aware, been observed. It is a matter of certainty, however, that the puparium does not occur attached to its host.

After its deposition, a month or more must elapse before it gives rise to the fly that meanwhile has been developing within it; and for the further life of this it must gain access to a host animal or otherwise die in one way or another. However, when once the relation between host and insect has been established, its longevity—for an insect—is evidently protracted.

Intermediary for Disease Propagation.

The Horse Spider—or Tick Fly—has not been shown to serve as a carrier, much less to take a special part in the development of any "germ" or parasite of other kind capable of producing, or essential to the production of, disease in any animal. In which respect, therefore, it must be placed in a different category from its ally, the Tsetse Fly (*Glossina*), or ticks of one kind or another, &c.

Notwithstanding, it must be borne in mind that two other species of *Hippobosca*—viz., *H. maculata,* Leach, and *H. rufipes,* von Olfers—have been mentioned as being capable of disseminating a trypanosomiasis of cattle associated with "gall sickness" in the Transvaal (*cf.* Comptes Rendus Hebdom. des Sciences et Mem. de la Sociéte de Biologie, 1903, pp. 242-3).

Again another pupiparous fly, very distinct from *Hippobosca,* named Lynchia maura, has been similarly shown to serve as the carrier of a disease of pigeons, due to the parasite *Halteridium columbæ.*

Dissemination and Local Increase.

Hippobosca equina, Linné, has already a very extended range of occurrence. Austen informs us (1906, p. 64) that there are specimens in the British Museum (N.H.), London, not only from the European countries but from Algeria, Cape of Good Hope, Madeira, Canary Islands, St. Michael, Azores, Trebizond, Turkey in Asia, Upper Burmah, Celebes, Fiji, New Caledonia; to which may be added, on the authority of other writers, Nigeria and Persia. It is significant, perhaps, that *Hippobosca* does not appear to occur in the "New World."

When we consider how closely, in all respects, the fly is associated with its special host (and how, too, it may attach itself to other animals, as hosts also), and the extent to which the transference of these potential carriers of it from place to place is effected, this wide distribution of this Spider Fly is readily intelligible; but not so its detection, when present upon them, this being not readily practicable on account of its active and furtive habits.

It must not, however, be assumed that, in countries in which it is established, it is generally prevalent therein; even in those in which it has long occurred. Linné, writing in the Fauna of Sweden in 1761, describes it as one of the insects of that country, but it is still very local there. And although Jean Barbut, as we know from a literary citation, made by Miss Ormerod, mentions it as a British insect in 1781, and notwithstanding it occurred in the New Forest district (Hampshire) sixty years since so numerously that Curtis, writing then, stated that "from their flanks [those of white horses running there] the spider flies may be swept in handfuls" (Cyclopædia of Agriculture, ed Morton, vol. II., p. 99), yet it is still only prevalent in England in the locality mentioned, and in some parts of Wales, although also specimens have been received from Dorsetshire.

When we consider that the female *Hippobosca equina* produces but a single individual at a birth—and that, by reason of its life-history, weeks must occur between the production of one fly and another, and that many enemies ordinarily confront insect life generally—we can readily understand how this increase must be surprisingly slow, and the dissemination of the insect correspondingly abridged.

Hence, even were the parasite very pernicious (which is not the case), the occurrence of a few individuals in any locality need not occasion much apprehension of ill effects threatening our equines. Newstead (1907) has dealt with the mode in which the *Puparium*, or so-called "chrysalis," of it may be conveyed from place to place, so that there is no reason to presume that it may arrive here in cargoes of grain—a means suggested to explain its advent by our correspondent (*vide* p. 267).

Its Original Home.

With regard to the original home of this Spider Fly, it is perhaps idle to speculate; but the probability is that it corresponds with that whence the horse itself originated; and it is significant that Northern Africa to-day appears to be the region also in which the genus *Hippobosca* finds its most numerous exponents. Southern Europe should, it is considered, be excluded from this consideration. Thus the writer can find no mention of it in any of the numerous Latin writers on "Res Rustica" (Agriculture) whose works are extant, not excepting the veterinary manual of R. Vegetius "Ars Veterinaria sive Mulomedecina" (ed. Gesner 1735), who deals especially with the ailments of the horse.

However, in the fables of the Greek Æsop, there is one that possibly has reference to this insect, but of this only the Latin version has been preserved:—

"Starent Quadrigæ cum paratæ cursui,
Musca advolans temoni earum insederat;
Misso ergo signo, illisque procurrentibus,
Pulsu Rotarum et Quadrupedantis ungulæ
Pulveres Nubes mota opacit diem:
Tum in se ipsa gestiens, Dii magni, ait,
Quantam profundi vim excitari pulveris!"*

—*Fabularum Æsopicarum Delectus* (A. Alsop), Oxoniæ, 1698, p. 120.

In these lines the great moralist evidently alludes to an insect quite distinct from the fly that alighted upon the mule in the same situation when the slow gait of this patient animal was far from making the dust fly, for it is made to object—*Quam tarda es!* (*Op. cit.*, Fab. 193, pg. 110.)

This authority on natural history—one whose works were already extant in the age of Plato, Euripides, Aristotle, and Herodotus—has been quoted, since the indication of the original home of an insect has great value for those who—as do entomologists in these recent times—may figure in modern Oydsseys, in quest of one insect wherewith to subdue another, for the parasite of *Hippobosca equina* itself still awaits discovery.

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* The steeds stood ready on race intent
When a fly approaching to their temonus went,
The sign received, now spinning they go
The wheels fly 'round they dash on so.
The dust in clouds
The daylight shrouds
Reflecting then, "great gods!" said he,
"What a terrible stour caus'd I've to be."

(H.T.)

General Notes.

A NEW ALLY.

PART PLAYED BY BEES IN FIGHTS ON LAND AND SEA.

The busy bee is distributed widely in all parts of the world! How often the prying instinct of the worker belies her intense energy. her untiring devotion to life's work, her life's task—an immense task—to be fulfilled in all too short a span of days. Oft, on a summer day, an unwelcome visitor, hovering insistently, at no discreet distance, as if there were no work in life but to pry into the affairs of others. But it is merely that she will miss no possible chance. And, considering her comparatively insignificant size, what a wonderful amount of respect she commands.

The attention of the world is centred on the war upheaval in Europe! In the actual war zone it would seem incredible that the bee could, in any possible way, receive notice, or attract attention! Yet the bee has been in evidence, has, with that wonderful assertiveness all its own, actually helped the Allies.

Belgian's Bee-Bomb.

A handful of Belgians were barricaded on a bee farm. An attack was made by an overwhelming force of Germans. When the end appeared inevitable, the beehives were thrown over the barricades, at a few yards' range, into the mass of Germans. In ten minutes the last German had fled! The situation had been saved by these new allies.

Even in South Africa the bee has claimed attention. At East London the story is told of the mounted corps ready for the front, and a swarm of bees meeting in the street, the former swerved perceptibly, broke in disorder from its line of route, and passed hurriedly on the other side. In modern times, as existing records show, the Germans appear to have suffered particularly from bee attack in war. At the battle of Sadowa, relates General Moltke, in his history of the 1866 campaign, during the height of the battle, a shell burst among some beehives, in a position occupied by his men. Sabre or bullet were of no use, the men had great difficulty in defending themselves from the fierce determined attack made on them by the bees, which resulted in the Prussians retreating, leaving four dead on the field of battle. The leading bee journals have recently contained many references to the curious and interesting association of bees and war. The "British Bee Journal" states that the first recorded instance occurred in England—about the year 908 A.D. Danes and Norwegians coming from Ireland, laid siege to Chester. Protected by hurdles, beneath the city walls, an attempt by the Danes was made to undermine the city walls. Rocks were hurled down upon them, also boiling honey. The hurdles were then covered with hides. Then the bees came into play. "The English, as a last resort, gathered all the beehives in the city, and flung them down upon

their foes. The Danes were so frightfully stung on the legs, hands, and heads, that, in despair, they abandoned the siege." The next instance, we are told, occurred thirty years later. Otto the Great was at that time laying the foundations of the German Empire. A revolt led by the Duke of Lorraine, was, up to a point, successful, until one, Immo the Crafty, came to King Otto's assistance. By his advice, large numbers of beehives were collected, and flung out against the Duke's horsemen during the attack. The bees poured from the hives, the maddened horses became uncontrollable, the defenders made a sally and the rout was complete. At the siege of Acre by the Christians, military engines were made for slinging beehives. The Bishop of Puy caused all the beehives at and in the neighbourhood of Namur to be collected and sent to the front. These were to be fired at the city, to keep the Saracens at bay, while the fortress was being undermined. A sufficient supply of this "ammunition" having arrived, twenty-five mangonels commenced slinging their hives at the same moment. . . . The bees went swarming into the enemy's ears, stinging them in the eyes and torturing them until they fled. Then the Christians broke through the walls, and in this manner was taken and conquered, the noble city of Acre.

The "American Bee Journal" also refers to other instances. recorded by Appian, the Themiscyrans, besieged by Lucullus, turned upon the enemy "not only bears and other ferocious beasts, but also swarms of bees." And a quotation from the siege of Massa: "The besieged having thrown their hives of bees in the breaches, the Crusaders were assailed by this new kind of enemies which annoyed them very much."

Similar "annoyance" was experienced in the fourteenth century by troops of the Sultan of Turkey, while besieging the city of Alba, Hungary. Passages were defended by hives of bees, purposely placed, and "the gravest militia of the Ottoman Empire" refused to advance.

A Portuguese writer of the sixteenth century, relates that in 1513, the army of King Emanuel, besieging a town, after reducing the garrison to dire straits, was "driven away by hives of bees, thrown from the town walls." A quotation also from Montaigne, referring to the siege of Tamly, by the Portuguese: "The inhabitants carried hives of bees, of which they had a wealth, and drove the bees so rudely against the enemy that they abandoned the enterprise."

French Bees Rout Prussians.

In the 1870 war, French bees inflicted a decisive defeat on Prussian troops. The "Journal of Montmedy" describes the incident. The battle of Beaumont, which began by a surprise, owing to the carelessness of the general in command of the French Army. An apiary, in the ground adjacent to the village, and near by 100 hives, arranged in orderly manner, in rows; each covered in as was the custom in those parts, with old clothes, hats, or caps. A charge at dusk by German troops. "Francs-tireurs," in position, without doubt! An opportunity to repay many an old score! The decorated skeps, however, proved more formidable opponents even than "Francs-tireurs."

Crusaders' Hive Slingers.

Then we read of an English MSS., still in existence in the Library at Oxford, which "actually describes the mangonels or catapults used in warfare for slinging bees.

Coming down to more recent times, we read of a mishap to a picket of French cavalry, in the war of Hanover, in 1758; the cavalry being quartered near some hives of bees, in an orchard: "One of the horses overturned several of the hives. The bees assailed the men; several horses perished, some of whom, blinded, struck their heads against the walls and the trees."

A Naval Auxiliary.

And, lastly, we read actually of the use of bees in a fight at sea. The date, early in the eighteenth century. A small corsair, with a crew of fifty men, matched against a Turkish galley, manned by 500 men. The larger vessel, boarded by a party from the smaller, and, at the moment of boarding, colonies of bees, in earthenware jars, which had been brought for the purpose, thrown from the masthead of the corsair, on to the deck of the galley. "The bees scattered in all directions. The Turks were so ill-used by them that they thought only of sheltering themselves. But the men of the corsair, who had provided themselves with gloves and masks assailed them with sabres and took the galley almost without resistance."—"Farmers' Advocate."

The editor of the "Farmers' Advocate" adds:—Since the above was written, news has arrived from German East Africa which brings the history of the part played by bees quite up to date. It is reported that the Germans used native hives in the defence of Tanga and when the British troops had landed, fired into them. The enraged bees attacked the soldiers and Sepoys, practically making it impossible for them to advance.

Answers to Correspondents.

ONION-GROWING.

H.F., Imbil—

1. The best method of getting rid of winter weeds would be to fallow the land during the previous winter, working it well up so as to get rid of all weed seeds.

2. In regard to the production of seed, I would suggest planting the original crop much earlier than June—say, about the end of March or beginning of April. This would give the onions a chance to fully mature before the hot summer months, when they would be most likely to seed the following season. This suggestion has been adopted by several growers in the South Burnett with excellent results as far as increased yield was concerned.

The Markets.

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR SEPTEMBER, 1916.

Article.		SEPTEMBER.
		Prices.
Bacon	lb.	9d. to 1s.
Barley	bush.	4s. 3d.
Bran	ton	£5
Broom Millet	,,	£21 to £23
Butter	cwt.	149s. 4d.
Chaff, Mixed	ton	£2 10s.
Chaff, Oaten	,,	£5 10s. to £5 15s.
Chaff, Lucerne	,,	£3 5s. to £5 10s.
Chaff, Wheaten	,,	£4 5s. to £5 15s.
Cheese	lb.	8d. to 8¼d.
Flour	ton	£12 5s.
Hams	lb.	1s. 3d. to 1s. 4d.
Hay, Oaten	ton	£5 to £5 10s.
Hay, Lucerne	,,	£4 to £5 5s.
Honey	lb.	6d.
Maize	bush.	3s. to 3s. 8d.
Oats	,,	3s. 9d.
Onions	ton	£5 10s.
Peanuts	lb.	3d. to 4d.
Pollard	ton	£5
Potatoes	,,	£4 5s. to £12
Potatoes (Sweet)	cwt.	3s. 6d.
Pumpkins (Cattle)	ton	£1 5s.
Eggs	doz.	10d. to 1s.
Fowls	pair	6s. to 8s.
Ducks, English	,,	5s. to 5s. 3d.
Ducks, Muscovy	,,	7s. to 8s.
Geese	,,	8s. to 8s. 6d.
Turkeys (Hens)	,,	13s. to 14s.
Turkeys (Gobblers)	,,	30s. to 36s.
Wheat	bush.	5s.

VEGETABLES—TURBOT STREET MARKETS.

Cabbages, per dozen (practically unsaleable)	6d. to 1s.
Beans, per sugar bag	2s. to 3s.
Beetroot, per dozen bunches	9d. to 1s 3d.
Carrots, per dozen bunches	6d. to 1s.
Cauliflowers, per dozen	1s. to 5s.
Chocos, per quarter-case	1s. 6d. to 2s.
Celery, per bundle	1s. 3d. to 3s. 9d.
Custard Marrows, per dozen	1s. 3d. to 3s.
Vegetable Marrows, per dozen	1s. 3d. to 3s.
Lettuce, per dozen	4d to 9d.
Parsnips, per dozen bunches	9d. to 1s. 3d.
Peas, per sugar bag	1s. 9d. to 4s.
Sweet Potatoes, per sugar bag	1s. 3d. to 2s.
Table Pumpkins, per dozen	1s. 3d. to 1s. 6d.
Tomatoes, per quarter-case	3s. 6d. to 5s.
Turnips, per dozen bunches	4d. to 6d.
Rhubarb, per dozen bundles	6d. to 1s.

SOUTHERN FRUIT MARKETS.

Article.	AUGUST. Prices.
Bananas (Queensland), per case	10s. to 14s.
Bananas (Fiji), per case	15s. to 16s.
Bananas (G.M.), per case	16s. to 17s.
Custard Apples, per tray	4s. to 6s.
Mandarins, per case	8s. to 10s.
Mangoes, per case	...
Oranges (Navel), per case	12s. to 18s.
Oranges (other), per case	7s. to 9s.
Passion Fruit, per half-case	4s. to 4s. 6d.
Lemons (Local), per bushel case	6s. to 10s.
Papaw Apples, per double-case	7s. to 10s.
Persimmons, per half-case	...
Pineapples (Queens), per double-case	7s. 6d. to 9s.
Pineapples (Ripleys), per double-case	5s. 6d. to 7s.
Pineapples (Common), per double-case	5s. 6d. to 7s.
Tomatoes, per quarter-case	2s. 6d. to 5s. 6d.
Strawberries (Queensland), per tray	4s. 6d. to 5s. 6d.

PRICES OF FRUIT—TURBOT STREET MARKETS.

Article.	SEPTEMBER. Prices.
Apples, Eating, per case	9s. to 10s.
Apples, Cooking, per case	7s. 6d. to 8s.
Bananas (Cavendish), per dozen	3d. to 5½d.
Bananas (Sugar), per dozen	1¾d. to 3½d.
Cape Gooseberries, per quarter-case	4s. to 8s.
Citrons, per cwt.	12s.
Cocoanuts, per sack	12s. to 15s.
Custard Apples, per quarter-case	4s. to 5s.
Granadillas, per quarter-case	...
Lemons (Lisbon), per case	6s. to 10s.
Limes, per quarter-case	...
Mandarins, per half-case	7s. to 9s.
Mangoes, per case	...
Oranges, (Navel), per case	9s. to 12s.
Oranges (other), per case	6s. 6d. to 7s. 6d.
Oranges (Seville), per cwt.	10s.
Papaw Apples, per quarter-case	1s. to 1s. 6d.
Passion Fruit, per quarter-case	4s. to 6s. 6d.
Peaches, per quarter-case	...
Pears, per half-bushel case	7s. to 11s.
Peanuts, per pound	3d. to 4d.
Persimmons, per quarter-case	...
Plums, per case	...
Pineapples (Ripleys), per dozen	1s. to 2s.
Pineapples (Rough), per dozen	1s. to 2s.
Pineapples (Smooth), per dozen	2s. to 3s.
Quinces, per case	...
Rockmelons, per dozen	...
Rosellas, per sugar-bag	1s. 6d. to 2s.
Strawberries, per dozen boxes	3s. to 8s.
Tomatoes, per quarter-case	1s. 6d. to 4s.
Piemelons, per cwt.	5s.
Watermelons, per dozen	...

TOP PRICES, ENOGGERA YARDS, AUGUST, 1916.

Animal.	AUGUST. Prices.
Bullocks	£19 12s. 6d. to £24 7s. 6d.
Bullocks (Single)	...
Cows	£12 10s. to £17 10s.
Merino Wethers	38s. 3d.
Crossbred Wethers	38s.
Merino Ewes	24s. 3d.
Crossbred Ewes	24s.
Lambs	30s. 9d.
Pigs (Porkers)	...
Pigs (Slips)	...

EXHIBITION SALES, 1916.

Animal.	AUGUST. Prices.
Bullocks (Champion)	£42
Bullocks (Guessing)	£36
Bullocks	£35 15s.
Cows (Champion)	£25 10s.
Cows	£21 15s.
Sheep (Merino Wethers)	43s. 6d.
Sheep (Crossbred Wethers)	79s.
Sheep (Crossbred Ewes)	34s.
Lambs	46s.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S.

TIMES OF SUNRISE AND SUNSET AT BRISBANE AND THE PHASES OF THE MOON FOR THE THIRD FOUR MONTHS OF 1916.

Date.	SEPTEMBER.		OCTOBER.		NOVEMBER.		DECEMBER.	
	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	6·3	5·33	5·29	5·47	4·59	6·5	4·46	6·28
2	6·2	5·33	5·28	5·48	4·58	6·6	4·46	6·29
3	6·1	5·34	5·27	5·48	4·57	6·7	4·46	6·29
4	6·0	5·34	5·26	5·49	4·56	6·8	4·46	6·30
5	5·59	5·35	5·25	5·49	4·55	6·8	4·46	6·31
6	5·58	5·36	5·24	5·50	4·55	6·9	4·46	6·31
7	5·57	5·36	5·23	5·50	4·54	6·10	4·46	6·32
8	5·56	5·37	5·22	5·51	4·54	6·10	4·46	6·33
9	5·55	5·37	5·20	5·51	4·53	6 11	4·47	6·34
10	5·54	5·38	5·19	5·52	4·52	6·11	4·47	6·34
11	5·53	5·38	5·18	5·52	4·52	6·12	4·47	6·35
12	5·52	5·39	5·17	5·53	4·51	6·12	4·47	6·36
13	5·51	5·39	5·16	5·53	4 51	6·13	4·47	6·36
14	5·50	5·40	5·15	5·54	4·50	6·13	4 48	6·37
15	5·48	5·40	5·14	5·54	4·50	6·14	4·48	6·38
16	5·47	5·41	5·13	5·55	4·50	6·15	4·48	6·38
17	5·46	5·41	5·12	5·56	4·49	6·16	4·49	6·39
18	5·45	5·41	5·11	5·56	4·49	6·17	4·49	6·40
19	5·43	5·42	5·10	5·57	4·48	6·18	4·49	6·40
20	5·42	5·42	5·9	5·57	4·48	6·19	4·50	6·41
21	5·41	5·43	5·8	5·58	4·47	6·20	4·50	6·41
22	5·40	5·43	5·7	5·58	4·47	6 21	4·51	6 42
23	5·38	5·44	5·6	5·59	4·47	6·22	4·51	6·42
24	5·37	5·44	5·5	5·59	4·47	6·23	4·52	6·43
25	5·36	5·44	5·5	6·0	4·47	6·23	4·52	6·43
26	5·35	5·45	5·4	6·1	4·46	6·24	4·53	6·44
27	5 34	5·45	5·3	6·1	4·46	6·25	4·53	6·44
28	5·33	5·46	5·2	6·2	4·46	6·25	4·54	6·45
29	5·32	5·46	5·1	6·3	4·46	6·26	4·55	6·45
30	5·30	5·47	5·0	6·3	4·46	6·27	4·55	6.46
31	...	...	5·0	6·4	...	...	4·56	6·46

The Phases of the Moon commence at the times stated below in Queensland, New South Wales, Victoria, and Tasmania.

			H.	M.	
5	Sept.	☾ First Quarter	2	26	p.m.
12	,,	○ Full Moon	6	31	a.m.
19	,,	☽ Last Quarter	3	35	p.m.
27	,,	● New Moon	5	34	,,

The moon will be nearest the earth on the 9th at 11·24 p.m., and farthest from the earth on the 21st at 7·36 p.m.

4	Oct.	☾ First Quarter	9	0	p.m.
11	,,	○ Full Moon	5	1	,,
19	,,	☽ Last Quarter	11	8	a.m.
27	,,	● New Moon	6	37	,,

The moon will be nearest the earth on the 7th at 8 30 a.m., and on the 19th, at 3·12 p.m., at its farthest distance.

3	Nov.	☾ First Quarter	3	50	a.m.
10	,,	○ Full Moon	6	18	,,
18	,,	☽ Last Quarter	8	0	,,
25	,,	● New Moon	6	50	p.m.

The moon will be nearest the earth on the 1st at 4·48 a.m., and on the 28th at 5·42 a.m.; it will be farthest from the earth on the 16th at noon.

2	Dec.	☾ First Quarter	11	55	a.m.
9	,,	○ Full Moon	10	44	p.m.
18	,,	☽ Last Quarter	4	6	a.m.
25	,,	● New Moon	6	31	,,
31	,,	☾ First Quarter	10	7	p m.

The moon will be farthest from the earth on the 14th at 6·48 a.m., and nearest on the 26th at 10·30 a.m.

For places west of Brisbane, but nearly on the same parallel of latitude—27½ degrees S.—add 4 minutes for each degree of longitude. For example, at Toowoomba the sun would rise and set about 4 minutes later than at Brisbane if its elevation (1,900 feet) did not counteract the difference in longitude. In this case the times of sunrise and sunset are nearly the same as those for Brisbane.

At St. George, Cunnamulla, Thargomindah, and Oontoo the times of sunrise and sunset will be about 18 m., 30 m., 38 m., and 49 minutes, respectively, later than at Brisbane at this time of the year.

At Roma the times of sunrise and sunset during September, October, November, and December may be roughly arrived at by adding 16 minutes to those given above for Brisbane.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

[All the particulars on this page were computed for this Journal, and should not be reproduced without acknowledgment.]

Orchard Notes for November.

THE SOUTHERN COAST DISTRICTS.

November is somewhat of an off month for fruit, as the crop of strawberries is about over; pineapples, with the exception of a few off season fruit, are not ready for marketing; and citrus fruits of all sorts, with the exception of those grown in the latest districts, are now over. Bananas should, however, be improving, particularly if the season is favourable.

The most important work of the month is the cultivation of the orchard, as, in order to retain moisture in the soil, it is essential that the soil be kept in a fine state of tilth. Where the land is liable to wash, breaks should be left between the fine-worked land, or, even better, a good break of cowpea or other leguminous crop, valuable for producing nitrogen and humus, should be grown. All fruit pests should be attended to; cyaniding can be carried out where necessary, and is especially useful now in the case of the Red, Purple, Mussel, Circular Black, and Glover Scales. Fruit fly should be systematically fought; all infested plums, peaches, guavas, or other fruits should be gathered and destroyed, so as to prevent the spread of the pest. Sucking bugs of all sorts should be gathered and destroyed, the egg-clusters, as well as the immature and mature insects, being destroyed. Hand-gathering is as good a plan as any. Fig beetles should be destroyed by spraying with Kedzie's mixture; and the egg-clusters should be destroyed whenever found.

Bananas and pineapples can be planted during the month, taking care, in the case of the pineapples, not to set out suckers that will immediately throw out a fruit, but those that will become firmly established before they fruit. Examine the vineyard carefully, and keep it well worked. Look out for Oïdium and Black Spot, and treat for same as recommended in the Orchard Notes of the two previous months.

Early ripening grapes will be reaching maturity towards the end of the month; but few, if any, will he ripe. In any case do not market too immature fruit; rather wait a few days longer, till it is fit to eat.

THE TROPICAL COAST DISTRICTS.

The main crop of pineapples will ripen during the month; and if gathered at the right time—viz., when fully developed, but not turned colour—they will carry all right South, if carefully handled and well packed. Papaws and granadillas are still in season, and will meet with a good Southern demand; they must be packed in cases containing only a single layer of fruit, and should be sent in the cool chamber. I am certain that a good market can be got for these fruits in both Melbourne and Sydney, particularly at this time of the year, when their winter fruits are off and their summer fruits are not yet on.

Watch bananas carefully for fly. Keep the orchards well cultivated.

Only ship good mangoes South; far too much rubbish is sent to Brisbane. Good mangoes will pay to pack properly, but the common sorts, which predominate to an enormous extent, will barely pay freight, if there is a good crop. The canning of good types of fibreless mangoes of good flavour is well worth taking up commercially in the North, as a ready sale for the canned fruits can be obtained.

As in the Southern Coast districts, all fruit pests should be sytsematically fought, and the orchard should be kept in a good state of tilth, as, once the wet season starts, there is little chance of cleaning up weeds and rubbish of all kinds, or of cultivating and sweetening the soil.

THE SOUTHERN AND CENTRAL TABLELANDS.

The earlier kinds of summer fruits, such as cherries, will ripen during the month. See that, if fruit fly makes its appearance, it is systematically fought.

Look out for Codling Moth, and continue the sprayings with Kedzie's mixture.

Look out carefully for any San José scale that may have escaped the winter spraying, as, if the trees are sprayed whilst the young are hatching out, the bulk of the insects are killed and little damage is done either to tree or fruit.

The sulphide of soda spray is one of the best to use now. Keep Woolly Aphis in check, should it make its appearance, using the resin washes; or, if it and San José scale are both present, use the sulphide of soda spray.

Watch the vineyards carefully for Black Spot and Oïdium. Keep the orchard and vineyard well cultivated, so as to retain all the moisture in the soil required for the growth of the tree and development of the fruit. In the warmer parts, irrigate when necessary, following the irrigation by deep and systematic cultivation.

See that grape vines have plenty of foliage to protect the ripening fruit from sun scald, but yet not so dense a foliage as to induce Oïdium or Black Spot. Look out for Red Scale on citrus trees, and cyanide to check same. Look out for fruit fly in the early ripening fruits, and gather and destroy all that may be so affected.

Farm and Garden Notes for November.

Field.—Under ordinarily favourable conditions, harvesting the wheat and barley crops may now begin. Those who have oats for hay should cut it when the grain has formed, but before it is ripe, for then the plant is in its most nourishing condition. Destroy caterpillars on tobacco plants, and top the latter so as to throw all the strength into

the leaves. Keep down the weeds, which will now try to make headway; earth up any growing crops requiring the operation; sow maize, imphee, setaria, kafir corn, teosinte, sorghum, &c. Plant sweet potatoes, sisal hemp, yams, peanuts, and ginger. Cotton may still be sown in districts not subject to early frost.

Kitchen Garden.—Why do so few gardeners and farmers grow their own vegetables? This is a question frequently asked by visitors to the farming districts. The reason probably is, that vegetables require a good deal of care and attention, which means also a good deal of time taken from the ordinary farm work. In many cases it pays the farmer better to buy many kinds of vegetables than to grow them himself. The only vegetables grown on many fine farms are cabbages and pumpkins, not to class potatoes under the head. Many people have an idea that European vegetables cannot be grown during the hot summer months, but this is a great fallacy; the Chinese gardeners supply the towns with all kinds of vegetables, except, perhaps, cauliflowers, during the whole of the summer. It is, therefore, clear that, by constant work, plenty of manure, water, and some shade for seedlings, most vegetables can be produced during the hot months from November to March. If your ground has been trenched or deeply dug and well worked, the advantages will be seen during the coming months. It does not pay to work shallow-dug ground. When sowing and planting during this month, give plenty of room between the rows and the plants; otherwise they will be drawn up and worthless, and keep the ground open by constant forking and hoeing. Thin out melon and cucumber plants. It is a good plan to peg down the vines; they will then not be blown about by the wind; they will take root at intervals, and thus help the main stalk. Give plenty of water to tomatoes planted out last month. They should also be mulched. Sow cabbage, French beans, melons, lettuce, radishes, pumpkins, cucumbers, marrows, rosellas, &c.; and transplant for succession in calm cloudy weather.

Flower Garden.—Stake any dahlias which may be now above ground, and plant out the bulbs which were stored, in a moist place. If the weaker bulbs are reserved, they will come in for autumn planting. Take up all bulbs which have done flowering, and store them in a dry place. Winter-flowering plants will have gone off almost; still, the garden should be in full bloom, and will well repay the trouble bestowed on it, and a little fertiliser given as a top-dressing will assist the plants to bloom and look well for a longer time than if they were neglected. Give weak liquid manure to chrysanthemums, and allow no suckers to grow till the plants have done flowering. Take up narcissi. Do not store them, but plant them at once in new situations. Sow antirrhinum, balsam, zinnia, summer chrysanthemum, calliopsis, and nemophila.